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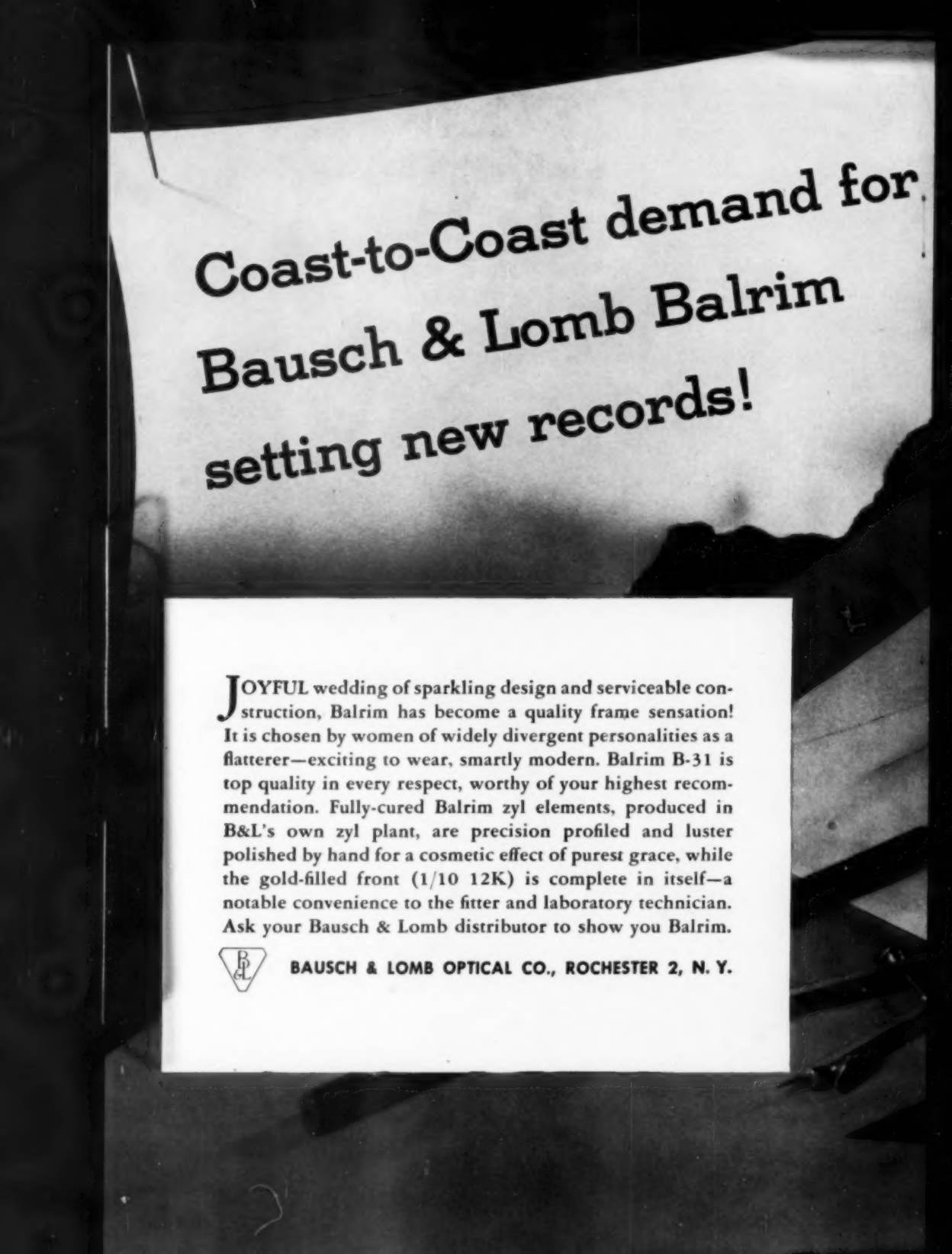
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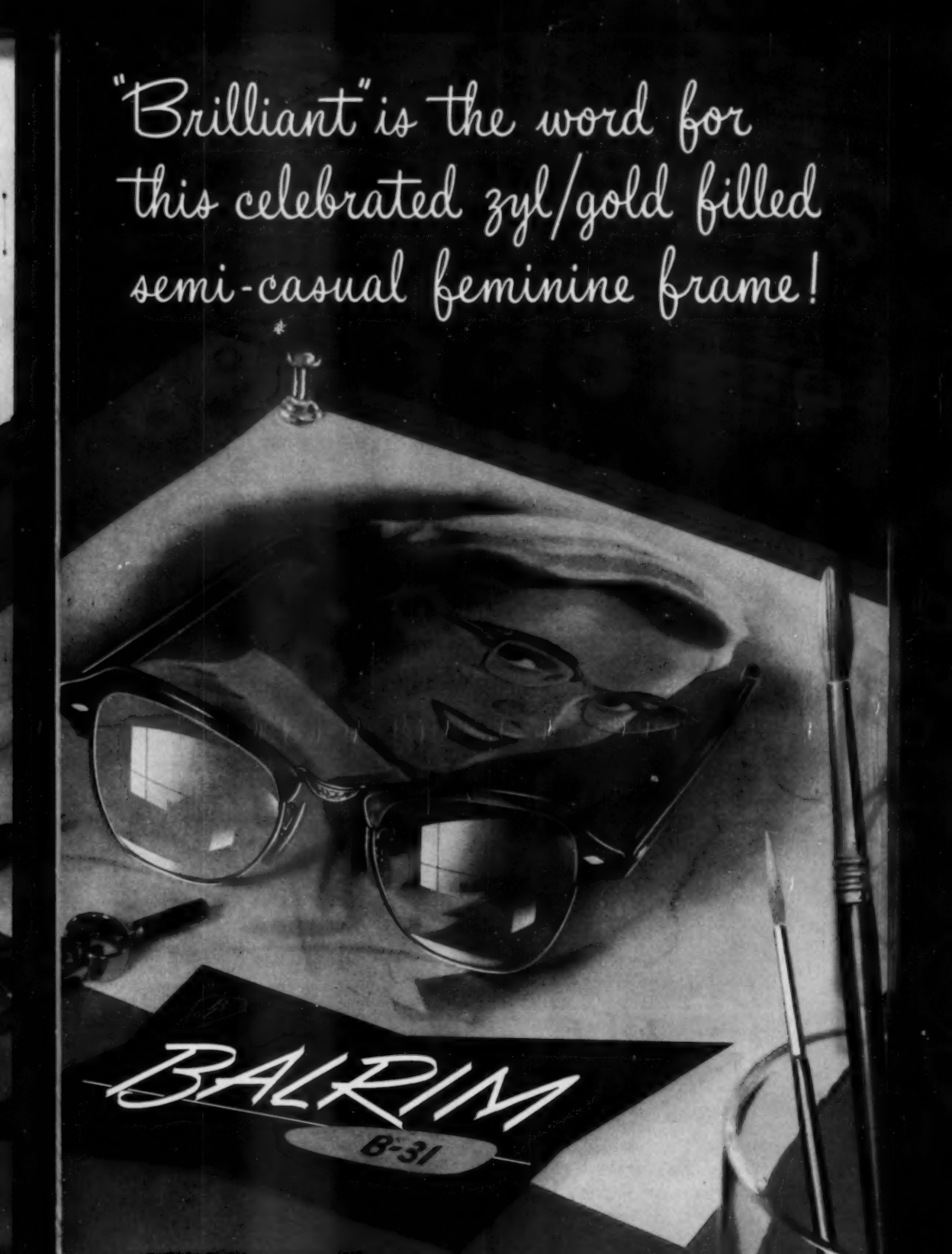
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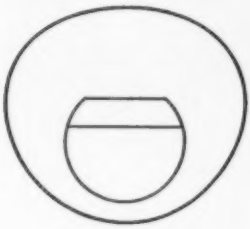

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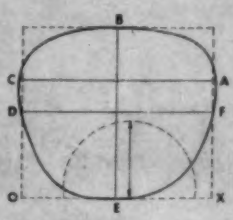

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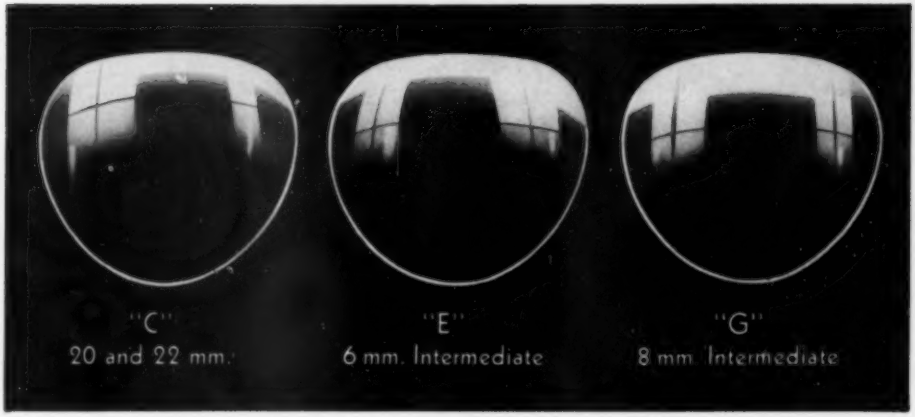

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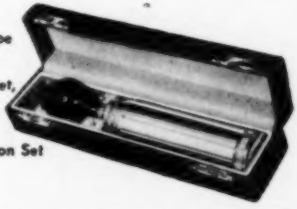

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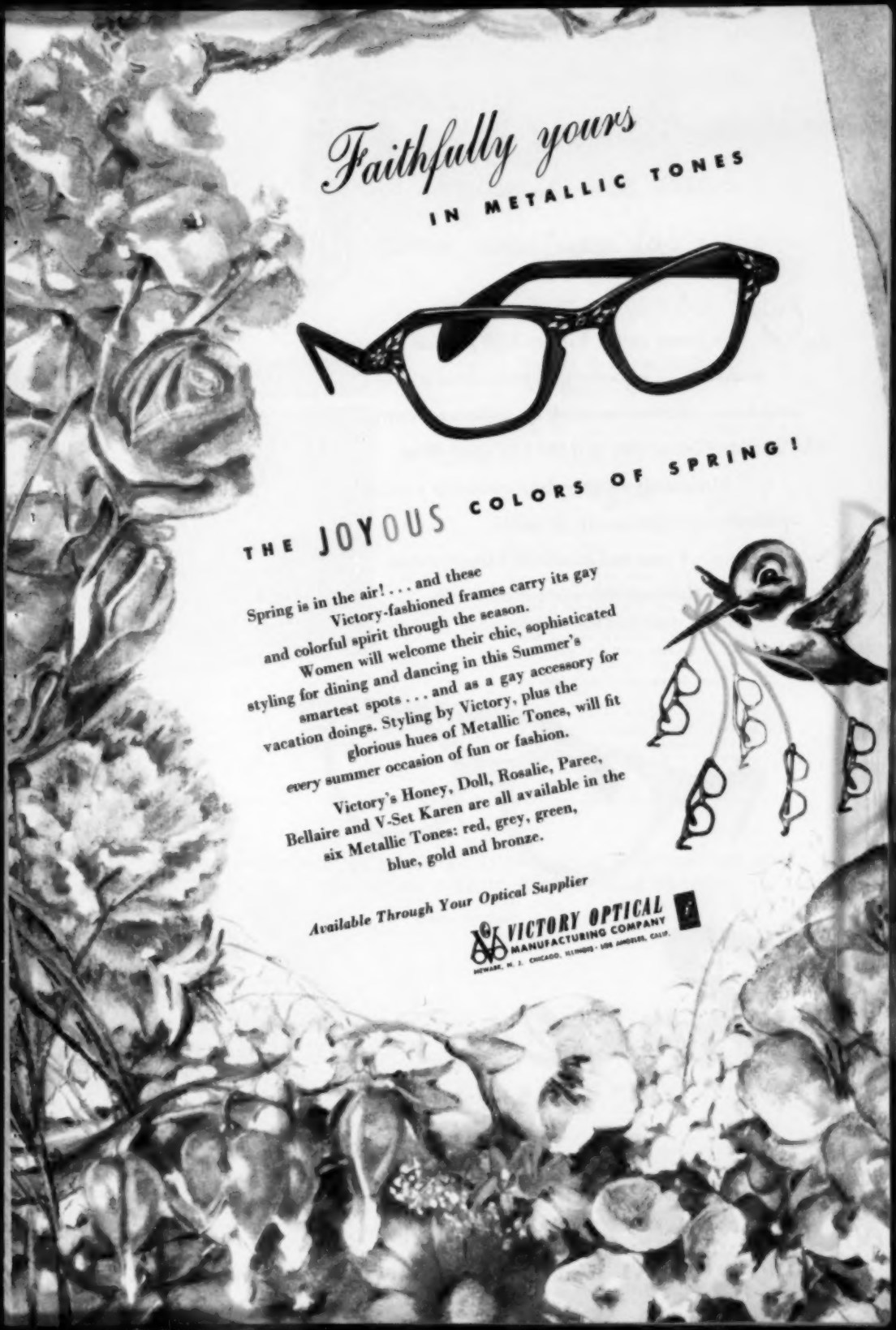
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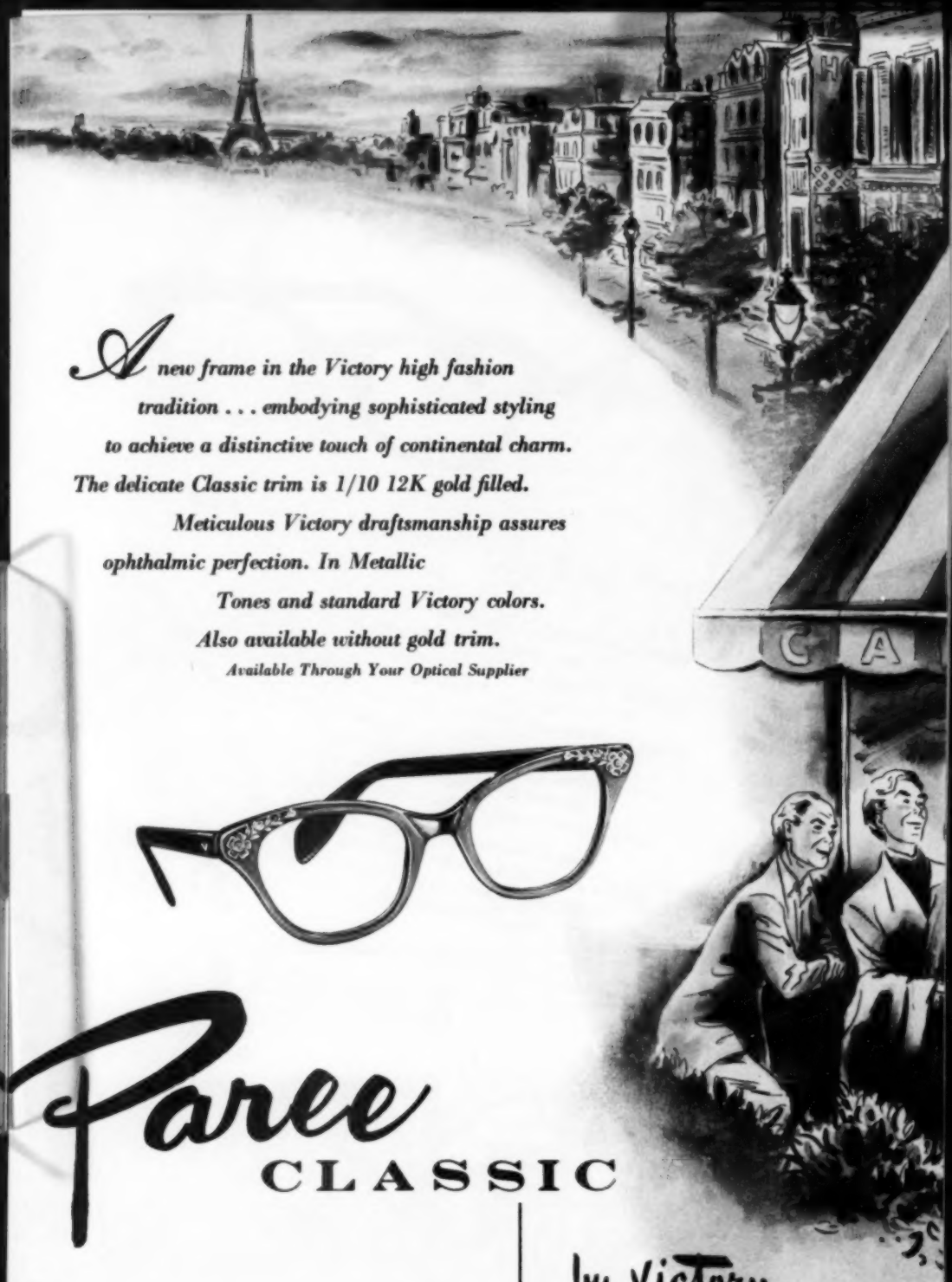

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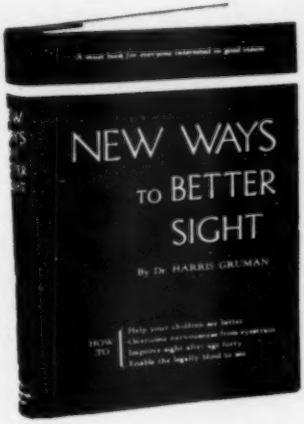

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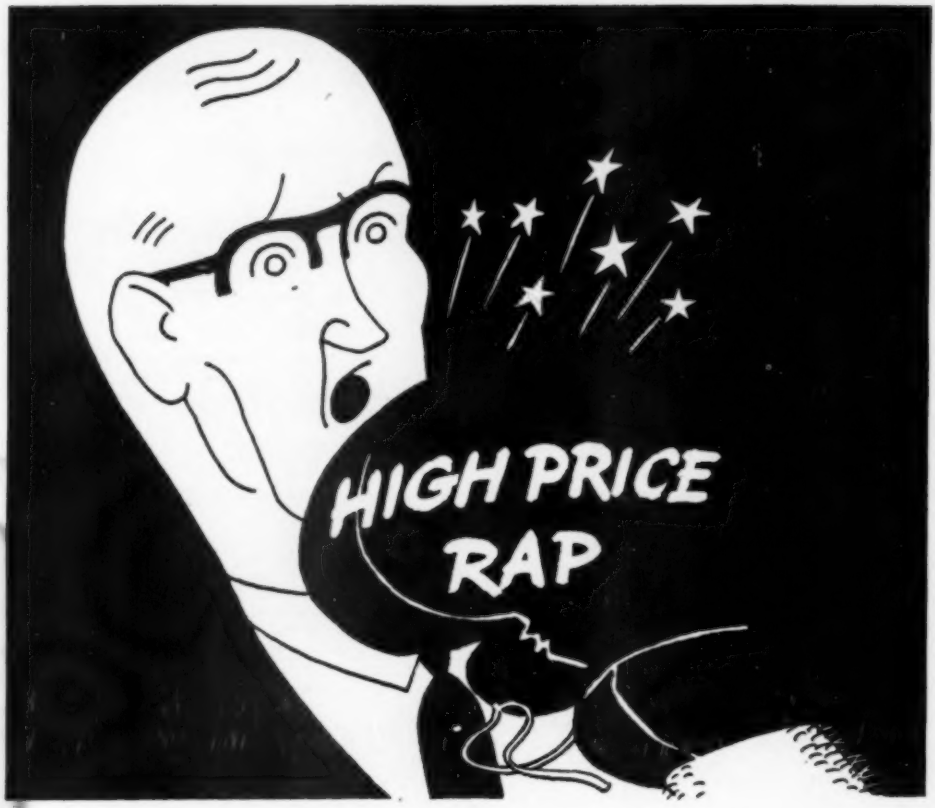

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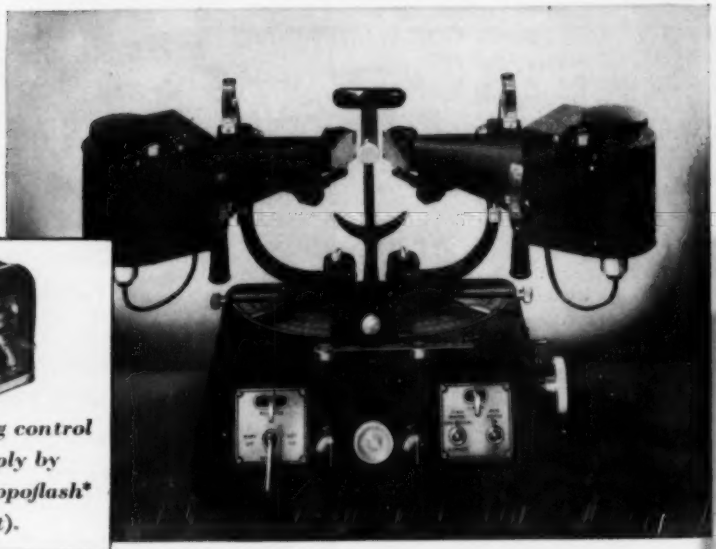

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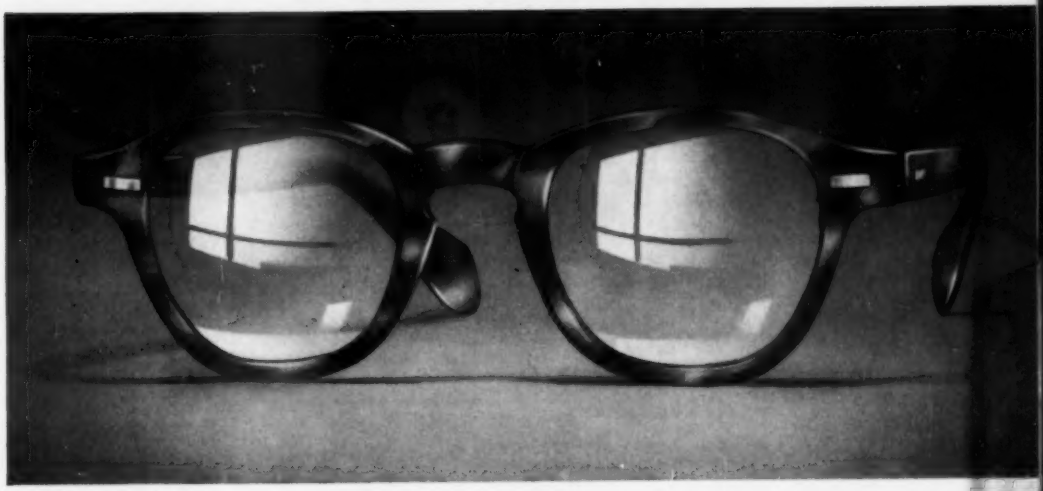

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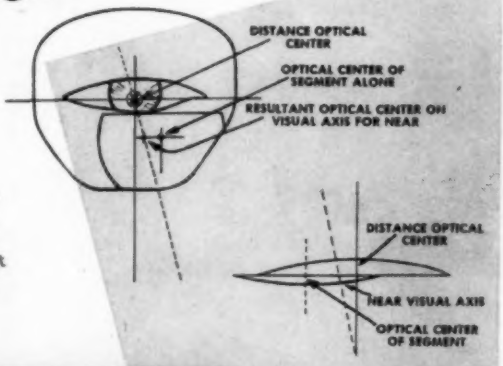
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THE RELATIONSHIP BETWEEN THE SIZE OF THE BLIND SPOT AND THE PRESENCE OF GENERAL INFECTION*

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In the past, the size and particularly an enlargement of the blind spot, has been considered diagnostically significant. Peter[1] states that an enlarged blind spot, which is not an anatomical variation may be indicative of sinusitus, toxic amblyopia, glaucoma, papillitis, papilloedema, or nephritic retinitis. Traquair[2] also claims that enlarged blind spots are significant, stating "the diagnostic significance of changes in the size of the blind spot depends not on the amount of the enlargement, but as in the case of any other scotoma, on the type of alteration." More recently Davidsen[3] has advanced the theory that a constricted blind spot is indicative of a "drainage type of infection existing above the shoulders." This author has cited a large number of persons who manifested a blind spot smaller than the normal (17 x 25 mm., according to Davidsen); reduced visual acuity and symptoms of ocular discomfort are reported frequently to accompany the constricted blind spot. Upon the completion of an examination by a physician and dentist some infectious condition usually in the teeth or sinuses was discovered. In most cases, Davidsen states, the blind spot was found to have increased to more nearly the normal size, visual acuity improved, and the ocular discomfort alleviated after the infection had been successfully treated.

It was the purpose of the investigation here reported to put the theory of Davidsen to a controlled test. The present authors were fully aware of the absence of any physiological reason for infection causing what amounts to an increased sensitivity of certain retinal areas. They were also aware of the unphysiological line of demarcation (the

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shoulders) for the site of the primary infection. Finally they were aware of the differences in technique between the method of Davidsen and other investigators. However, in the light of the large number of clinical observations presented by Davidsen it was felt that a controlled study was necessary.

METHODS

A questionnaire (Appendix A) was given to 140 students at the Los Angeles College of Optometry. These questionnaires were then analyzed by the authors, and the 24 subjects who seemed most likely to have an infectious condition were chosen as experimental subjects. At the other extreme, the 26 students who seemed least likely to have an infection were chosen as a control group. The investigator measuring the blind spot did not know in which group the subjects had been placed.

Blind spot measurements were made on the Davidsen Wottring Area Caeconometer,* in exactly the same manner as that described by Davidsen. It should be noted that in using the Davidsen technique the test object is moved from the seeing area to the non-seeing area instead of in the more customary method. This will, of course, indicate a blind spot somewhat smaller than that found by moving the test object from the blind area to the seeing area. However, since the present study was a comparison of two groups rather than a comparison of either group to an arbitrary normal it was felt that this did not constitute a major experimental fallacy.

After the blind spot had been measured, three different persons** calculated the area of the blind spot following the method of Davidsen. The three correlation coefficients between investigators were +0.93, +0.97 and +0.95, indicating that subjective differences in evaluating the size of the blind spot does not constitute a major difficulty. For the statistical analysis the averages of the scores obtained by each of the three investigators were used.

In order to obtain an objective measure of the presence of infection a white blood count was taken on all of the subjects.† It is realized that a white blood count is not the best test for infection; a differential count would have been of greater significance, but it was felt that the problem did not warrant the time necessary to do the additional labora-

*Designed and constructed by the Wottring Instrument Company.

**The two authors and Margaret Fegelman, secretary to the senior author.

†The authors are grateful to Mr. William Channell, a student at the Los Angeles College of Optometry, who kindly donated time and equipment and personally did all of the blood count work.

tory work. In general, there seems to be good agreement that a white count will reveal any gross infection. The laboratory technician was not aware to which group any subject belonged at the time he ran the blood test.

RESULTS

A number of interesting facts, not bearing directly upon the problem, were uncovered. One such fact concerns the number of colds per year among subjects who had not had their tonsils removed. These results are presented in Appendix B so as not to distract from the major purpose of the present study.

The numerical value for the blind spot size which has been used throughout the present study is that suggested by Davidsen. The blind spot is treated as though it were a rectangle, and its area is determined by multiplying width times length. The measure is then actually the size in square millimeters of that rectangle within which the oval shaped blind spot would just fit. A better measure would, of course, have been the area of the blind spot as measured by a planimeter, but it was considered well to use the technique of Davidsen wherever possible.

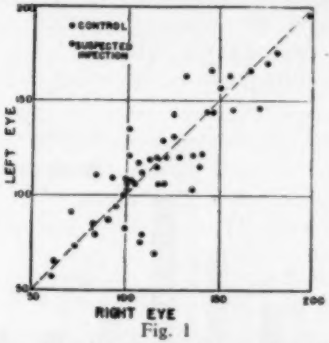

Fig. 1

Figure 1 presents the relative blind spot size of each eye for control group and the group with the suspected infection. The Pearsonian correlation coefficient was calculated and was found to be +0.86. This high positive correlation indicates that whatever is being measured is similarly affecting the size of the blind spot of both eyes. If the hypothesis advanced by Davidsen were correct, one would expect to find a heavy concentration of the solid circles (suspected infection) in the lower left corner of the diagram, i.e., smaller blind spot for both eyes. Inspection of the figure will reveal this is not the case. If the more customary hypothesis that infection is demonstrated by an enlarged

blind spot were valid, one would expect to find a heavy concentration of the solid circles in the upper right corner of the diagram; inspection reveals that there is a trend in this direction, the four observers with largest blind spots all being persons in the suspected infection group. Table I presents a summary of the blind spot size for 26 control group

TABLE 1—BLIND SPOT SIZE FOR CONTROL AND SUSPECTED INFECTION GROUPS

	Control	Suspected Infection
Number of Eyes	52	48
Mean Blind Spot Size	114.8	121.8
Standard Error of Mean	3.9	5.0
Standard Deviation	28.0	35.0
Standard Error of Standard Deviation	2.7	3.6
Difference between means: = 7	t = 1.11	P = .30

subjects (52 eyes) and for 24 suspected infection group subjects (48 eyes). It is seen that the mean blind spot size is larger for the group with suspected infection, this difference, however, being statistically non-significant. The probability that a difference as large as this could have occurred by chance is about 30 in 100.

The average blind spot size was calculated for each subject by averaging the blind spot size for right and left eye. The frequency distribution for the control group and the group with suspected infection

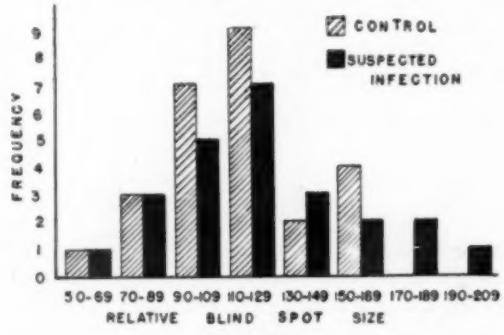

Fig. 2

is presented as Figure 2. Inspection of this figure reveals the same thing as the preceding analysis based upon treating the eyes separately, i.e., those cases with the largest blind spots were subjects in the suspected infection group. Other than this, there is little difference between the two groups. Thus, using the criterion of suspected infection, there

seems to be no confirmation for the hypothesis of Davidsen. The two groups exhibit a difference which, although nonsignificant, is in the direction of the suspected infection group having a larger rather than a restricted blind spot size.

The white blood count was taken for 45 of the observers, 23 in the suspected infection group and 22 in the control group. In Table 2

TABLE 2—WHITE BLOOD COUNT FOR CONTROL AND SUSPECTED INFECTION GROUPS

	Control	Suspected Infection
Number of Subjects	22	23
Mean White Count	7645	8739
Standard Error of Mean	328	462
Standard Deviation	1539	2215
Standard Error of Standard Deviation	232	327
Difference between means: = 1094	t = 1.93	P = .05

are presented the average white counts for the two groups. It will be seen that the group who suspected they had an infection had an average white count of approximately 1100 cells in excess of the control group. This difference in the average white blood cell count of the two groups is statistically significant, the probability of its being due to chance being less than 5 in 100. Thus, there is good agreement between the laboratory test of white blood count and the questionnaire submitted to the subjects. The group who suspected they had some infection had a white blood count statistically significantly higher than the control group.

The correlation coefficient between white blood count and relative blind spot area for the 45 subjects was +0.28. The probability that a correlation as high as this could be due to chance is 5 in 100. There is, therefore, a low, but significant, correlation between white blood count and blind spot area, the higher blood count being associated with the larger blind spot. The 45 subjects for whom the white count was known were divided into two groups on the basis of blood counts: since the average white count for the entire group was 8,204, the subjects with blood counts above the mean were placed in one group and those with white blood counts below this mean were placed in the

TABLE 3—BLIND SPOT FOR CASES WITH WHITE COUNT ABOVE AND BELOW MEAN BLOOD COUNT FOR GROUP

	White Count above 8204	White Count below 8204
Number of Cases	19	26
Mean Blind Spot Size	126.6	107.9
Standard Error of Mean	7.6	4.8
Standard Deviation	33.0	24.3
Difference between means: = 18.7	t = 2.09	P = < .05

other group. The analysis of blind spot size for these two groups will be found in Table 3. It is seen that the relative blind spot size was approximately 19 mm.^{2} larger for the group whose white count was above the mean. This difference is, as the table indicates, significant to the five per cent level.

CONCLUSIONS

On the basis of the experiments described, the following conclusions seem justified:

A. There is a high correlation between blind spot size of the right and of the left eye.

B. Those subjects in the present study who were aware that they had some condition which might be described as an infection exhibited a slightly larger blind spot size than those who felt that they were free of infection. The difference, however, was not statistically significant.

C. Seemingly the subject's diagnosis of infection in his own case was better than might have resulted from chance since the group suspecting an infection had an average white cell count significantly higher than that of the control group.

D. Although the correlation is too low to be of predictive value, there is a correlation between white blood count and blind spot size which differs significantly from zero. The correlation coefficient was positive, indicating that a high blood count tended to be associated with a larger blind spot.

DISCUSSION

The results obtained in the present experiment are contradictory to those obtained by Davidsen and are in agreement with the more customary interpretation of blind spot size. In view of the fact that Davidsen based his hypothesis on observations of 2,000 cases, the discrepancy is difficult to interpret. The present study reveals the fact that about half of the subjects who were given the questionnaire stated with varying degrees of certainty that they had some infection. Since this was a group of college students who might be expected to be one of the healthier segments of the population, it is possible that the majority of the patients coming to the optometrist feel that they have some type of infection. If, now, the test for the blind spot is one in which the target is moved from the seeing area to the blind area, a procedure which will give a smaller blind spot, and if most of the people visiting the optometrist can by questioning be brought to state that they have some infection then a spurious correlation between small blind spot and presence of infection might result. This solution is not, how-

ever, wholly satisfactory since Davidsen has stated that after treatment of the infection, the blind spot was found to be larger. We are faced then with the difficult situation of a relationship based upon clinical observation, which cannot be repeated under controlled conditions. The lack of any known physiological mechanism whereby infection would lead to an increased retinal sensitivity must also be considered. Although a satisfactory explanation of Davidsen's findings cannot be arrived at, it is felt by the present authors that in the absence of a physiological basis and in view of the results of the present control study an hypothesis that an infection causes a constricted blind spot cannot be accepted. On the basis of the present study the more usual hypothesis, that an enlarged blind spot occasionally accompanies certain infections, seems to be closer to the truth.

APPENDIX "A"

QUESTIONNAIRE FOR VISUAL FIELD EXPERIMENT:

The test being investigated is one which is said to be sensitive to any infection above the shoulders. An attempt is being made by the L. A. C. O. to determine whether such claim is valid. Answer questions to the best of your ability.

NAME:..... DATE:..... SEX: ..... AGE:.....

1) On the *average* how frequently do you have headaches? (circle 1)
   2 or more per week 1 per week every two weeks monthly
   two or three per year never
2) Does your head ache a) in back (occipital)
   b) in front (frontal)
   c) behind eyes
   d) sides
   e) top
   f) all over
   g) other (specify) .....
3) *Typically* when does the headache come on:
   a) upon awakening
   b) morning
   c) afternoon
   d) late afternoon
   e) evening
   f) other .....
4) Typically, how does the headache leave:
   a) wears off
   b) sleep it off
   c) aspirin
   d) other drugs or measures.....

Circle any of the following condiitons which you know you have, and write a few words telling how you know you have it, how long it has been present, what is being done about it, etc. If you merely suspect that you have one of these conditions, write word "suspect" after the condition.

a) Infected teeth
b) Impacted teeth
c) Pyorrhea
d) Sinusitis
e) Post-nasal drip
f) Deviated Septum
g) Other nasal disorders
6) Have your tonsils been removed: ..... Do you get sore throats frequently: .....
7) How many colds per year do you usually get?.....

8) Are you allergic to any substances:.....
Specify.....
.....
.....
.....

APPENDIX "B"

One hundred and thirty-three of the subjects answered both the question pertaining to tonsils and that pertaining to the number of colds per year. Fifty-two of the subjects still had their tonsils while 81 had had their tonsils removed. The frequency distribution and calculations for the number of colds per year for each of these groups is presented in tabular form below:

No. of Colds Per Year	Tonsils In	Tonsils Out
0	2	2
1	18	14
2	13	20
3	10	17
4	5	10
5	2	9
6	—	2
7	—	—
8	—	1
9	—	1
10	—	2
11	—	—
12	2	3
Number	52	81
Mean Number of Colds	2.46	3.40
Standard Error of Mean	.31	.29
Standard Deviation	2.27	2.61
Median	1.46	2.32

Difference between means: = 0.94 t = 2.21 P = .03

It is seen that the group who have had their tonsils removed have an average of one cold per year more than the group who have not had their tonsils removed and that this difference is statistically significant. the probability of a difference as large occurring by chance being 3 in 100. The difference between the mean and median for each distribution is an indication of the skewness of the distribution. The data have also been treated by the chi square technique and these results are presented below:

COLDS PER YEAR

	In	TONSILS	Out	
0-2	33		36	69
	(27)		(42)	
3 or more	19		45	64
	(25)		(39)	
	52		81	133

$X^2 = 4.55$
dF = 1
P = 0.03 to 0.04

The numbers in parenthesis indicate the expected on the basis of the marginal totals. the others being the number of cases observed. It is seen from the table that there is association between the two variables. those who have had their tonsils out tending to have more colds than would be expected on the basis of marginal totals. The probability again is between 3 and 4 chances in 100.

It was stated in the body of the article that these results had not been anticipated and are in no way associated with the main problem. that of the importance of blind spot size. However. the finding is interesting and may be of some value to researchers or practitioners in other healing arts. The presence of association. does not. of course.

give any knowledge as to cause and effect. From the data here presented there is no reason to believe that removal of the tonsils necessarily makes the patient more susceptible to colds. An equally plausible hypothesis would be one stating that those people who tended to have more colds tended to have their tonsils removed.

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THE USE OF A DENTAL MOUTH MIRROR TO INSPECT THE CONJUNCTIVA*

Charles C. Turner†
Cleveland, Ohio

In routine eye-work one of the most unpleasant procedures for the patient is the inspection of the superior palpebral and bulbar conjunctiva. To do this it is necessary to evert the upper lid. While not painful, this procedure is often an annoying one to the patient. Blepharospasm often intervenes. When attempting to evert the lids of children their cooperation is often lost for the balance of the ocular examination. Lid eversion is sometimes difficult when dealing with patients whose lids are "tight." For these reasons some mechanical device for inspecting the upper lid area without eversion would appear to have some value.

The use of a regular plano dental mouth mirror with good overhead illumination alleviates many of the difficulties involved in inspecting the superior palpebral and bulbar conjunctiva and fornix. The hand holding the mirror is placed against the temporal region of the patient's head for support. The edge of the mirror is held against the skin just above the inferior orbital margin. The upper lid is then pulled directly forward. The conjunctiva and fornix thus exposed are inspected with the aid of the mirror.

Few patients object to this portion of the external ocular examination when done in this manner. Most children are cooperative when this technique is used. Blepharospasm is not encountered so frequently as it is with the eversion method.

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†Optometrist.

ACCOMMODATION AND CONVERGENCE IN A PATIENT WITH ADIE'S PUPIL*

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In the Spring semester of 1950, Mrs. J. B., age 28, came to the clinic of the School of Optometry of the University of California. She complained primarily of discomfort and blurring of vision while reading. This difficulty had come on rather suddenly several months previously.

In the Fall of 1949 she went to visit relatives. One morning her aunt noted that the right pupil was larger than the left and that the pupil failed to constrict when she went out of doors into the sunshine. The patient was not aware of any sensation associated with this dilation at this time, although as time went on, she found reading more and more difficult. She had consulted several ophthalmologists and neurologists to find the cause of the dilation of the right pupil and to get relief from the reading difficulties. The diagnosis by all the ophthalmologists and neurologists was that she had Adie's Pupil and that nothing could be done.

Examination results: February 21, 1950.

1. Pupillary Reflexes:

The right pupil was considerably larger than the left. The direct and indirect light reflex constriction of the right pupil was entirely absent when a light was pointed at the right eye while those of the left appeared normal. The constriction to accommodation was normal but the onset was considerably delayed and the response slow. The constriction finally reached made this pupil somewhat smaller than the left. The onset of dilation of the right pupil on again looking at the distance was delayed and the response slower than the left.

2. Ophthalmoscopic examination:

The discs in each eye were entirely normal. The color was good and the outline sharp. There was normal physiologic cupping.

The color of the fundus was normal. There were no exudates or

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hemorrhages. The vessels were normal. The media clear.

3. Refraction:

Visual acuity, old lenses R. 20/25— L. 20/20

Visual acuity, no lenses R. 20/80 L. 20/80

Reads Jaeger 1 with either eye with old lenses although she must make considerable effort with right eye—also an appreciable length of time was needed to focus this eye.

Ophthalmometer R. 45.75/90 43.25/180
L. 46.50/90 43.00/180

Static skiametry R. +1.25 D.S. ⌒ —3.00 D.C. ax 10°
L. +1.25 D.S. ⌒ —3.25 D.C. ax 175°

Subjective to maximum visual acuity
R. +1.00 D.S. ⌒ —2.50 D.C. ax 15° VA 20/20
L. +0.75 D.S. ⌒ —3.00 D.C. ax 176° VA 20/20

Subjective to 20/20 R. +1.75 D.S. ⌒ —2.50 D.C. ax 15°
VA binocularly L. +1.50 D.S. ⌒ —3.00 D.C. ax 176°

Phoria: 1Δ esophoria No hyperphoria

Adduction: 30Δ/6Δ Abduction. 4Δ/2Δ

Accommodative amplitude
R. 5.0 D. L. 11.0 D. by Donder's method

Monocular cross cylinder (gross)
R. +2.50 D.S. ⌒ —2.50 D.C. ax 15°
L. +1.50 D.S. ⌒ —3.00 D.C. ax 176°

Binocular cross cylinder (gross)
R. +2.25 D.S. ⌒ —2.50 D.C. ax 15°
L. +1.25 D.S. ⌒ —3.00 D.C. ax 176°

Dynamic skiametry (to reversal)
R. +3.00 D.S. ⌒ —2.50 D.C. ax 15°
L. +1.75 D.S. ⌒ —3.00 D.C. ax 176°

Following tests made through
R. +1.75 D.S. ⌒ —2.50 D.C. ax 15°
L. +0.75 D.S. ⌒ —3.00 D.C. ax 176°

Near phoria: +5Δ (Right eye fixating)

Base-out to blur: 26Δ Base-in to blur: 8Δ

Near point of convergence: 1.5 cms.

Old lenses: R. +1.00 D.S. ⌒ —2.75 ax 20°
L. +1.00 D.S. ⌒ —2.62 ax 180°

Supplementary data: March 9, 1950.

Monocular cross cylinder: (gross)
R. +2.50 D.S. ⌒ —2.50 D.C. ax 15°
L. +1.00 D.S. ⌒ —3.00 D.C. ax 176°

Binocular cross cylinder: (gross)

R. +2.00 D.S. ⌒ —2.50 D.C. ax 15°

L. +0.50 D.S. ⌒ —3.00 D.C. ax 176°

The near phoria was now determined with each eye fixating in turn. A 6Δ prism was placed base-down before the left eye. The left eye was then occluded. The subject was instructed to fixate the target seen by the right eye. The occluder was removed for only a moment. She was instructed to maintain fixation on the lower target at all times and to keep this target in sharp focus. When the upper target appeared, she was to state whether it was to the right or the left of the lower one. While the occluder was in place, base-out or base-in prism was placed before the left eye. The mid point between the limits of 100 per cent certainly was taken as the phoria reading. Similar measurements were made with —2.00 D.S. added O.U. and +1.00 D.S. added O.U. In the case of fixation with the left eye, the process above was reversed eye for eye.

The following were the results:

Basic lenses in place: R. +2.00 D.S. ⌒ —2.50 D.C. ax 15°

L. +0.50 D.S. ⌒ —3.00 D.C. ax 176°

Lens added	Near phoria	
O.U.	Right eye fixating	Left eye fixating
None	+5Δ	central
—2.00 D.S.	+9Δ	+7Δ
+1.00 D.S.	+1Δ	—3Δ

This is shown graphically in Figure 1. The assumption was made that the basic refractive error, as far as the sphere was concerned, was R. +1.00 and L. +0.75. With the subjective lens correction in place, there was no detectable difference in the distance phoria with change in fixation from right to left eye using a modified cover method described above except that dissociation was obtained with a Maddox Rod.

The most interesting part of the examination, aside from the pupillary reflexes, is the difference in the amplitude of accommodation of the two eyes and the resultant unequal adds found in the cross cylinder tests and in dynamic skiametry. At the time of the first refraction, the added lens power in the case of the monocular cross cylinder was R. +1.50 D. S., L. +0.75 D.S. Thus the add required for the right was twice that of the left. This is almost exactly proportional to the difference in the measured amplitude of accommodation.

Since there was some obvious interference with the accommodative mechanism of the right eye, the near phorias and fusional reserves were judged to be unreliable as to absolute value. It is interesting, however,

to note that in the second refraction of March 9th that the near phoria was more esophoric with the right eye fixating, in spite of the fact that there was a +1.00 D.S. add before this eye and none before the left.

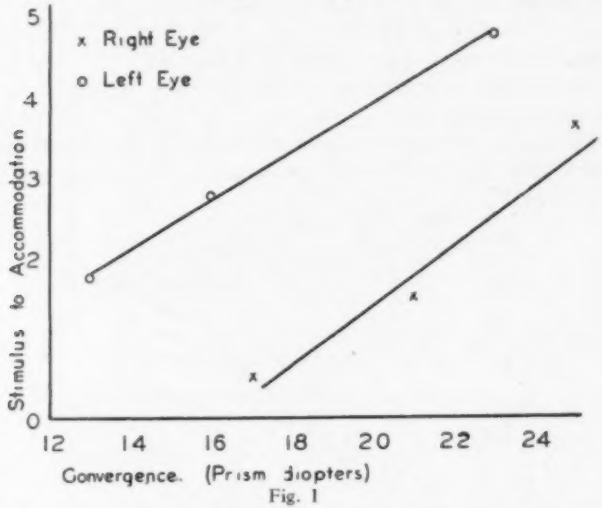

Fig. 1

Figure 1 makes this difference even more evident. There appears to be a very slight difference in the ACA mediated by the right and left eye. The ACA of the right seems, at first glance, to be less than that of the left whereas the contrary would be expected from consideration of the distance and near phorias. This apparent discrepancy was thought to be due to the fact that the data are given in terms of stimulus values to accommodation rather than in response values. This assumption was later proved to be correct when haploscopic data were available.

A temporary prescription in a mount-over frame was given for near use. This was R. +1.00 D.S., L. +0.25 D.S. The old lens before the left eye was rotated so that axis of the cylinder was 176° instead of 180°. The right lens was rotated so that the axis of the cylinder was 15°.

On March 23 the patient returned to state that the new lenses resulted in complete relief from reading difficulties. At this visit a subjective refraction was made using the Turville Infinity Binocular Balance method.[1]

T.I.B. Subjective

R. +1.00 D.S. ⊂ —2.75 D.C. ax 14° VA 20/20

L. +0.75 D.S. ⌒ —3.00 D.C. ax 178° VA 20/20
Monocular Cross Cylinder Add R. +1.50 D.S. L. +0.75 D.S.
Binocular Cross Cylinder Add R. +1.25 D.S. L. +0.50 D.S.
Through R. +1.75 D.S. ⌒ —2.75 D.C. ax 14°
L. +0.75 D.S. ⌒ —3.00 D.C. ax 178°
Base out to blur 12Δ Base in to blur 8Δ

The patient was referred to Dr. Harrigan of the clinic for a haploscopic examination.*

The accommodative response of each eye was determined for various stimuli to accommodation presented to the left eye. These data

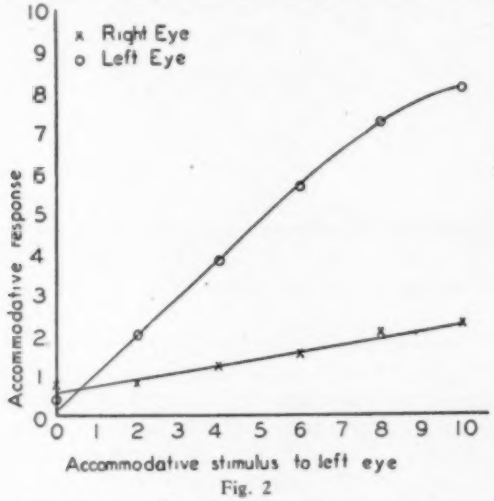

Fig. 2

are shown in Figure 2. It will be noted that the right eye starts at the zero stimulus level at about the same point as does the left; namely, an accommodation of about 0.50 D. Up to a stimulus value of 7.0 D. the response of the left eye keeps pace with the stimulus. The right eye, however, falls further and further behind the stimulus.

The accommodative response of each eye was also determined for various stimuli presented to the right eye. Again the marked difference in response of the two eyes is apparent. This is shown in Figure 3.

In Figure 2, the slope of the left eye response line is 0.85 per diopter stimulus while the right is 0.18. In Figure 3, the slope for the

*This particular haploscope contains a self-recording mechanism designed by Dr. Harrigan. The construction of the mechanism was made possible by a grant from the American Academy of Optometry.

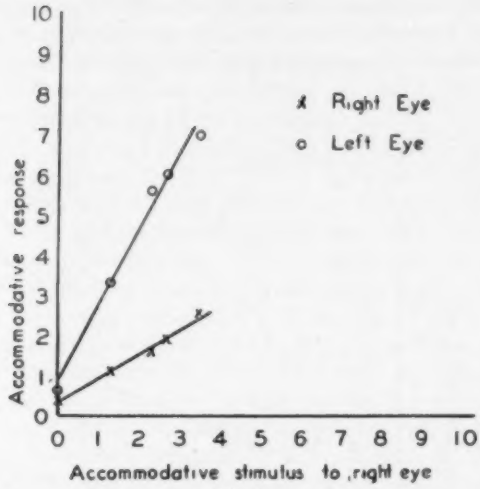

Fig. 3

left is 1.87 and the right 0.59. In other words, when the stimulus is applied to the left eye, the right responds in the ratio of 1 to 4.7. When the stimulus is applied to the right, the left responds in the ratio of 3.2 to 1 for the right.

This difference in ratios depending on which eye is fixating is easily explained. If one examines Figure 2, it is apparent that when the stimulus is applied to the left eye accommodation responds in the amount necessary to keep the target fixated clear up until the limit of accommodation is reached. The right eye accommodative response is only that possible by the neural impulses originated by the left eye stimulus—in other words the right eye accommodative mechanism plays a passive role. Now when the stimulus is applied to the right eye, accommodation is stimulated as much as possible under the circumstances to obtain clear vision. This time the left eye is passive and the response is that required for the right eye to see clearly within the range of its response.

The associated accommodative-convergence was also determined. This is shown in Figure 4. The accommodative levels represent response values rather than stimulus values. The ACA ratio for the left eye is very slightly more than 4Δ/1.00 D. while of the right is 13.5Δ/1.00 D. Thus the ACA for the right is in the ratio of 3.4 to 1 to that induced by the left eye accommodation.

The similarity in response to the stimulus to accommodation and the resulting accommodative convergence is noticeable. The fact that the ACA mediated by accommodation of the right eye is about 3.5 times

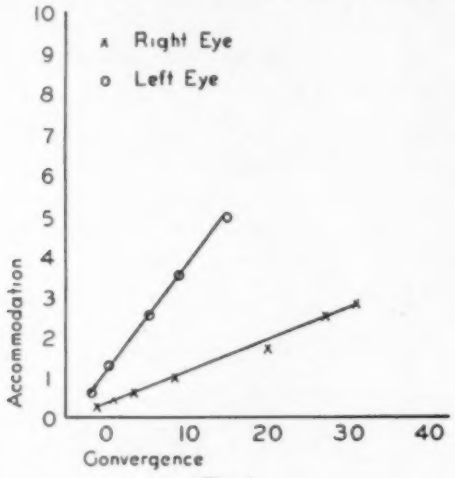

Fig. 4

that mediated by accommodation of the left eye means that in all probability the amount of effort required to change the focus of the right eye 1.0 D. was equal to that required to change the focus of the left eye about 3.5 D.

Unfortunately, the absolute limit of accommodation of the left eye and the associated accommodative convergence were beyond the range of the haploscope. It would be of interest to know whether the absolute value of accommodative convergence would be identical regardless of which eye was fixating.

If one inspects Figure 2, it would appear that the limit of accommodation for the left eye would be about 8.5 D. If the ACA line in Figure 4 for the left eye is extended to this value, the convergence is about 29Δ. The maximum accommodation for the right eye appears to be about 2.75 D. for which the convergence is slightly in excess of 30Δ. One may assume without too much error that these values are equal. It would thus appear that the innervation supplied accommodation was equal but that the response of the two eyes differed.

This should be compared to the ratios given above. The accommodative convergence obtained when the accommodative response is a

maximum is identical in spite of the differences in ratios. This indicates that the total magnitude of the neural stimuli from the III nerve nucleus to each eye is equal. The fact that the physical accommodation is different can only be explained by assuming a failure in the mechanism some place peripheral to the III nerve nucleus.

The assumption made above that the physical limit of accommodation for the right eye was 2.75 D. was based on the fact that the maximum accommodation found for this eye was 2.75 D. as shown in Figure 4. There are certain implications from this that are not apparent at first glance. It would appear that the accommodation of the right eye is not limited by the response mechanism, as assumed in presbyopia. The response of the left eye is 3.2 to 1.0 to that of the right. Now then, if the relationship is linear; that is, the same effort is required to change accommodation from say 4.0 D. to 5.0 D. as to change accommodation from 1.0 D. to 2.0 D.; then one can safely multiply this ratio by the amplitude of the right eye to determine what the response of the left eye should be; namely 2.75 x 3.2 = 8.80 D. This is extremely close to the assumed amplitude of the left eye. It would indicate that there is no physiological reserve for accommodation in the left eye. In other words, the whole of the neural possibilities are utilized in accommodating 8.50 D. On the other hand, if the assumption is made that the ACA ratios reflect the amount of innervation originating in the III nerve nucleus, the response should be 2.75 x 3.4 = 9.35. This would indicate some slight physiologic reserve. The data, however, are not sufficiently clear cut to be dogmatic about the possible inferences. The best that can be said is that if there is any physiologic reserve at all, it must be small.

In this case, it is important to know, if possible, the site of the lesion. It might be assumed that these data indicate that in other cases where the amplitude of accommodation is reduced, such as in presbyopia, that more effort is required to accommodate 1.0 D. than is required to accommodate 1.0 D. when the amplitude is high. Certainly the great increase in ACA when the right eye is fixating over that which is present when the left eye is fixating might be presumed to be an argument for this point of view. Direct measurements on presbyopic subjects[2] do not support this conclusion.

The difference between this case and a presbyopic one is in the site of the lesion. In presbyopia the lens does not respond to the change in the ciliary muscle. In this case, the lens is capable of response but the neural impulses do not seem to reach the ciliary muscle in full force

but the associated impulses to convergence are fully effective.

The cause for Adie's pupillary response is not definitely known as can be seen from the following statements of Duke-Elder.[a]

"The clinical history is characteristic. The vast majority of affected persons are females, and the age of onset, although considerably variable, is most commonly the third decade. The onset is usually sudden, the patient observing that one eye has become misty or her friends noting the unequality in the size of the pupil."

"The aetiology of the condition is speculative since no pathological examination has been made. It is certainly not due to syphilis, and although some few cases have occured in syphilitics, this is certainly incidental. Most authors place the disturbance in the central sympathetic system (Behr, 1921, Adie, 1931-32, Kennedy, Worbes, Richard and Fair, 1938); Lowenstein and Friedman, (1942) considered the malady a heredo-degenerative disturbance affecting the vegetative centers of the diencephalon and their connections with the mesencephalon. McKinney and Frocht (1940) suggested a lesion in the pretectal region. Adler and Scheie (1940), reasoning from the abnormal response to cholinergic drugs, concluded that the lesion lay in the ciliary ganglion or peripheral to it, a view supported by Leathart (1942). Finally, James (1944) ascribed the condition to general asthenia, the tonic reaction being in his view essentially atonic."

It will be noted that the discussion above does not involve the reduction of accommodation which was demonstrated in this patient. The reduction in accommodation is apparently not always a characteristic of the Adie pupil syndrome. The interference with accommodation, however, was extremely important in this case since it was the primary cause for the patient seeking aid. The reduction in the amplitude with a simultaneous change in pupillary reflexes would indicate that the lesion involved in this case was somewhere on the motor side between the third nerve nucleus and the eye. The assumption is based on the fact that the common path for pupillary activity and accommodation is on the motor side. The sensory path for pupillary activity in response to light is shunted off before the optic tract reaches the lateral geniculate body. Accommodation, on the other hand, seems to have its activity governed by impulses originating in the cortex. If the lesion were in the midbrain, the accommodative-convergence relationship exhibited by this patient would be extremely difficult to explain.

It is generally stated that the pupillo constrictor fibers and the fibers mediating accommodation originate at the Edinger-Westphal

nucleus and travel peripherally to the ciliary ganglion where a synapse occurs. The post ganglionic fibers thus go directly to the sphincter of the iris and to the ciliary muscle as the short ciliary nerves. It is extremely interesting to note that Foerster, Gagel and Mahoney[4] found that removal of the ciliary ganglion in apes destroyed the light reflexes of the pupil but did not destroy the contraction of the pupil in the near reflex. This may mean that the motor pathway for pupillary contraction as mediated by light differs from that in which the contraction is mediated by accommodation or it could be that additional fibers are available and the replacement is not complete. This enforces the probability that the lesion was at or near the ciliary ganglion.

The data presented here, as well as the observations of Foerster, Gagel, and Mahoney, might be explained on the basis of the neural connections postulated in the schematic diagram shown as Figure 5. Here convergence is represented by the medial recti, accommodation by the lens, and pupillary activity by the iris.

When the image is blurred, impulses arise in the cortex to pass down to the Edinger-Westphal nucleus. Here a synapse occurs with fibers passing to the nucleus of Perlia, to the ciliary ganglion and to the accessory episcleral ganglion of Axenfeld. Those fibers passing to the nucleus of Perlia induce convergence while those going to the ciliary ganglion and the accessory ganglion induce changes in accommodation and pupil size. Fusional convergence impulses are assumed to arise in the cortex and pass directly to the nucleus of Perlia. The function "convergence accommodation" is represented by a connection between the convergence "center" and the accommodative "center" at the cortical level. This connection is assumed on the basis of measurements on normal subjects. If the assumption is made that the lesion in this patient with Adie's pupil is peripheral to the Edinger-Westphal nucleus near the ciliary ganglion, all the facts cited above can be accounted for by the diagram.

When the right eye fixates a near object, impulses arise from the cortex and pass down to the nuclei of Edinger-Westphal and Perlia. This induces accommodation in both eyes and convergence. Now the impulses to accommodation in the right eye are reduced by the lesion but the impulses to convergence are not. On the basis of the actual response, it would appear that about 5/7 of the fibers are destroyed or impaired. Pupillary constriction will accompany the accommodation of the right eye due to impulses which pass via the accessory episcleral ganglion. Pupillary activity mediated by light passing via the ciliary ganglion will not be effective since these impulses would be blocked

at the ciliary ganglion. More accommodation results in the left eye than in the right and if one measures the amount of convergence with respect to the accommodation of the right eye, the ACA ratio will appear to be high. On the other hand, if the relationship is measured with respect to the accommodation of the left eye, the ACA ratio will appear to be normal. It would thus appear that the conclusion of Adler and Scheie is correct with respect to the site of the lesion.

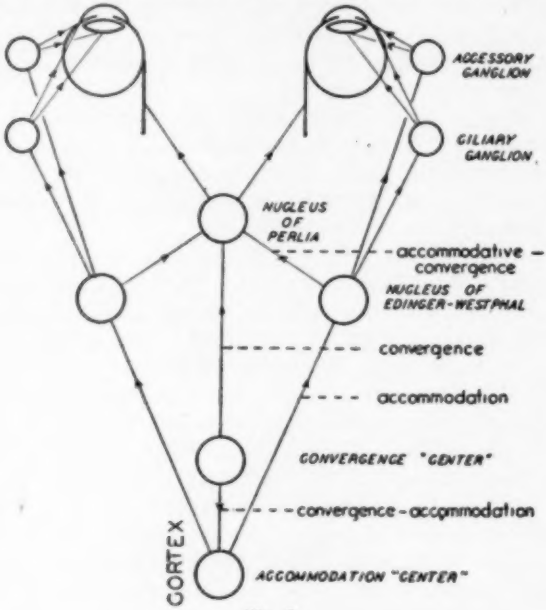

Fig. 5

The scheme presented in Figure 5 can be tested by the data obtained on other subjects. Fry,[5, 6] Morgan[7] and Hofstetter[8] have shown that when convergence is stimulated that accommodation is changed in some subjects but not in others. When the change does occur, the values obtained are identical to those obtained in accommodative-convergence measurements. These two separate observations can best be explained on the assumption that the connection convergence to accommodation is cortical. Impulses arising from the convergence "center" would pass then, when the learned path is present, both directly to the convergence function and indirectly by way of the accommodative-convergence mechanism.

This assumption is further strengthened by the observations of Knoll[9] and Marg and Morgan[10] as to the pupillary reflexes. Pupillary constriction always occurs when accommodation is stimulated. On the other hand, pupillary constriction is not present in some subjects when fusional convergence is stimulated. This can be easily explained on the assumption that the connection convergence to accommodation is cortical and is learned.

This theory then assumes that the association between accommodation and convergence is at the mid-brain level and is therefore an innate reflex very similar to those reflexes governing pupillary activity.

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ABSTRACTS

OPHTHALMOLOGY AND OPTOMETRY IN THE NAVY. Rear Admiral C. A. Swanson. The Sight-Saving Review. 20.4. 225-228. Winter issue. Published by the National Society for the Prevention of Blindness, New York City. 1950.

This article summarizes the ophthalmic needs during World War II, the screening of naval recruits and the creation of a Hospital Volunteer Specialist Corps providing for the commissioning of optometrists.

At the close of the war, there were 124 optometrists commissioned as reserve officers in the Hospital Specialist Corps of the Navy. The services rendered by the optometry officers during the war demonstrated the need for optometrists in the Regular Navy as well as the Naval Reserve. Accordingly, in 1947 the Medical Service Corps was created by an act of Congress. This law provides for the commissioning of optometrists in the Medical Service Corps of the Regular Navy and of the Naval Reserve. The author states that there is a definite need for the professional ophthalmologic-optometric relationship in the Naval Medical Department. The relationship between the Navy ophthalmologists and the Navy optometrist is one of teamwork, cooperation, and complete understanding as to their particular fields of endeavor.

R. E. B.

TRIFOCAL LENSES*

A CLINICAL STUDY BASED UPON 22,640 TRIFOCAL PRESCRIPTIONS

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Hanover, New Hampshire

I. INTRODUCTION

In the endeavor to teach various clinical aspects of prescribing for presbyopic patients, there arose a need for definitive information relative to trifocal lenses: their advantages, disadvantages, indications for prescribing and for not prescribing, etc.

Most text-books do not cover adequately the prescribing of trifocals. The neophyte ophthalmic practitioner and student notice that a great many of the older practitioners wear trifocals themselves but refer to their prescribing as a matter requiring considerable experience and judgment. There seems to have been an air of secrecy about trifocals and in an effort to dispel some of this lack of information, this study was undertaken.

It was felt that the best source of authoritative information would be that which could be provided by those practitioners who have had the most experience in prescribing trifocal corrections. Therefore, it was decided to poll the experiences of a nation-wide group of ophthalmologists and optometrists who had been in practice for many years.

II. HISTORICAL ASPECTS

The credit for the origin of trifocal lenses is as difficult to assign as that for the invention of spectacles. While Benjamin Franklin, by virtue of a letter preserved in the Library of Congress (1784) is given credit universally for the invention of bifocals, the idea of trifocal lenses seems to have been less well documented.

The earliest date of the concept of trifocals is that given by Hofstetter,[1] who reports that John Isaac Hawkins‡ of London described his invention of trifocal lenses in 1826. However, Shreiner[2] claims that William K. Kight of Dexter, Missouri, originated trifocals in 1905.

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*Read before the annual meeting of the American Academy of Optometry, Chicago, Illinois, December 10, 1950. For publication in the May, 1951, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

This study was aided by a grant from the Univis Lens Company and was initiated when the author was assistant professor in optometry, Columbia University, New York, N. Y. Formerly, the author was assistant professor in Applied Physiological Optics, Dartmouth Eye Institute, Dartmouth Medical School, Hanover, N. H.

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‡Dr. Ralph I. Lloyd, author of *History of Eyeglasses*, Guildcraft, June, July, 1942, in recent correspondence pointed out an illustration of Hawkins' trifocal lenses in *Die binokulre Instrumente*, Moritz von Rohr, p. 43, 2 ed., 1920.

Marks[3] states that the first commercially practical trifocal was made available in this country about 1910 as the result of the efforts of Charles W. Connor of Indianapolis, Indiana. Emsley and Swain[4] state that A. J. Boness obtained an American patent on trifocal lenses in 1911. Duke-Elder[5] mentions that Gowland of Montreal introduced in 1922 "multi-focal lenses" under the trade name of "Ultifo." According to Theo. E. Obrig,[6] author of "Modern Ophthalmic Lenses and Optical Glass," the first practical commercial trifocal lenses were made by the Continental Optical Company in the early 1920's.

Yeates,[7] in a paper read before the New Zealand Association for the Advancement of Science in 1949, reported: "It is almost 40 years since trifocals were first produced commercially." He states that in England, prior to 1940, many varieties of trifocal lenses were available but they were used mainly for certain occupational problems and the average practitioner had little knowledge or experience with them. His reference unquestionably was made to Alfred H. Emerson, skilled English optical physicist and designer of the Univis lens series.

One American manufacturer[8] reports that up to the end of 1938, they had provided 2,106 pairs of trifocals but, by the end of 1948, they had filled prescriptions for 300,000 pairs. This indicates clearly a growing demand for this type of correction and the need for information relative to its clinical indications.

III. THEORETICAL CONSIDERATIONS

As is well known, the amplitude of accommodation decreases with age. Presbyopia, with diminished range of near point vision, is common to individuals over 40 years of age.

According to Berens,[9] the changes which cause presbyopia are mainly a lessening of the plasticity of the crystalline lens and an increase in its index of refraction rather than any marked weakness of the ciliary muscle. Courtney[10] has stated that regardless of how little effect the ciliary muscle can have on the crystalline lens in presbyopia, nevertheless, it (the ciliary muscle) does continue to try to exert some influence in the interest of clear vision and it is this effort which produces as much discomfort as if it were actually molding the lens. Therefore, aside from the efficiency of clear vision for presbyopic patients, it is also necessary to consider the factor of comfort from the physiological standpoint. Thirdly, there is the psychological factor. When a person is not able to do visual tasks efficiently and comfortably, he is susceptible to conflict, frustration and concomitant fatigue.[11]

Bifocal lenses have made young again the vision of many older people who wish to participate in tasks which would be impossible for

them were it not for their bifocal lenses. However, there is a limitation in range of use for which bifocal lenses will enable presbyopic individuals to see near-point tasks clearly. The accompanying figures (I & II) illustrate the range of clear vision that is possible with bifocal lenses as compared to trifocal lenses.

A young emmetrope or properly corrected ametrope, having normal accommodation, can see clearly throughout a wide range extending from infinity to all ordinary near visual tasks. However, the gradual loss of accommodation with age begins to handicap individuals, beginning first about at the prime of their life span.

Bifocal corrections afford maximum clear vision within a small range of 13 to 16 inches depending upon the add prescribed. The range of vision beyond the optimum reading distance to arm's length and beyond is progressively more blurred. An intermediate add in the form of trifocals corrects for the most part this range of blurred vision.

In the accompanying diagrams (I & II), it is assumed, for the sake of simplicity, that 1 meter equals 40 inches. Therefore, the dioptric values of 2.50 and 3.00 will represent the common reading distances of 16 inches and 13.3 inches, respectively.

The amplitude of accommodation, expressed in diopters, is represented by the symbol "A." The add of the lower (bifocal) segment is referred to as "D." It is agreed generally that a presbyopic person is comfortable when using about half his available amplitude of accommodation and the remaining power necessary to see clearly at some specific near point is supplied by an add. For a 16 inch near point this relationship may be expressed as follows:

$$(1) \qquad D = 2.50 - \frac{A}{2} \qquad \text{(expressed in diopters)}$$

If "P" designates the distance from the eye to the midpoint of the range of clear vision as seen through the lower segment, then:

$$(2) \qquad P = \frac{40}{D + \frac{A}{2}} = \frac{40}{2.50 - \frac{A}{2} + \frac{A}{2}} = \frac{40}{2.50} = 16 \text{ inches.}$$

Should the individual exert the remaining half of his amplitude of accommodation, nearer objects can be brought into sharp focus as indicated by:

$$(3) \qquad PP = \frac{40}{D + \frac{A}{2} + \frac{A}{2}} = \frac{40}{D + A} = \frac{40}{D + (5 - 2D)} = \frac{40}{5 - D} \text{ inches.}$$

Should the individual relax completely his accommodation, his near

point of sharp focus is naturally farther away and may be expressed by:

$$(4) \qquad PR = \frac{40}{D + \frac{A}{2} - \frac{A}{2}} = \frac{40}{D} \text{ inches.}$$

The equations (2), (3), and (4) will provide the range of distinct vision beyond and within 16 inches in terms of the add, D, of the lower segment.

The inclusion of an intermediate segment (I) provides a significantly useful range beyond that of the normal reading distance. A common practice is to prescribe one-half of the reading add (D) in the intermediate segment. Therefore,

$$(5) \qquad I = \frac{D}{2} \text{ (diopters).}$$

If P_I designates the distance from the eye to the midpoint of the range of clear vision through the intermediate add, then:

$$(6) \qquad P_I = \frac{40}{I + \frac{A}{2}} = \frac{40}{\frac{D}{2} + 2.50 - D} = \frac{40}{2.50 - \frac{D}{2}} = \frac{80}{5 - D} \text{ inches.}$$

Should the individual exert another $\frac{A}{2}$ diopters of accommodation, he will see clearly for a nearer point, whose distance is:

$$(7) \qquad PP_I = \frac{40}{I + \frac{A}{2} + \frac{A}{2}} = \frac{40}{I + A} = \frac{40}{\frac{D}{2} + 5 - 2D} =$$

$$\frac{80}{D + 10 - 4D} = \frac{80}{10 - 3D} \text{ inches.}$$

Should the individual relax $\frac{A}{2}$ diopters of accommodation, he will be in sharp focus for a further point, whose distance is:

$$(8) \qquad PR_I = \frac{40}{I + \frac{A}{2} - \frac{A}{2}} = \frac{40}{I} = \frac{40}{\frac{D}{2}} = \frac{80}{D} \text{ inches.}$$

The equations (6), (7), and (8) will indicate the intermediate range of clear vision provided by the use of a trifocal intermediate segment.

If, instead of a desired optimum reading distance of 16 inches, the requirements of an individual necessitate a reading distance of 13 inches, the above equations can be modified accordingly.

Graphs such as Figures I and II with "D," the power of the lower segment, plotted as the ordinate and "P," the midpoint of clear vision, plotted on the abscissa, are very useful and instructive. The equations for 16 inches and 13 inches reading distances follow the graphs.

Referring to Figure I for a 16 inch reading distance, an individual requiring a bifocal add of 1.75 would have a total near point range from 12.3 to 22.8 inches, with 16 inches as the optimum of sharp comfortable focus. Such an individual may rarely require a range closer than 12 inches but he might frequently need clear vision at arm's length (i.e., beyond 23 inches). By means of a trifocal intermediate correction of 0.87 D., his total range would be extended to 45.7 inches. Thus, a trifocal correction would give a total range from 12.3 to 45.7 inches (about 1 foot to 4 feet) as contrasted to 12.3 to 22.8 inches (1 foot to 2 feet). In other words, a trifocal correction would double his range of useful near point vision.

An individual requiring a bifocal add of 2.00 D, which is the most frequently prescribed add for patients over age 50, would be able to see near objects clearly only within a range of 13.3 to 20.0 inches and would be handicapped severely for tasks at arm's length. By prescribing a trifocal intermediate correction, the near point range would be extended to 40.0 inches or doubled that available with bifocals.

With an individual requiring a correction for a mean reading distance of 13 inches, the advantage provided by trifocals is even more significant than for one whose average reading distance is 16 inches.

If one wished to use Donder's tables, as modified by Duane, instead of, or in conjunction with, the indicated presbyopic add on the ordinate of the graphs, then the ages corresponding to the expected adds could be noted for either the 16 or 13 inches reading distance. However, helpful as Donder's tables may be for indicating the expected amplitude of accommodation for certain age groups, it should be realized that they are statistical averages which are not always applicable in individual cases. Most practitioners prefer to measure their individual patient's amplitude of accommodation and determine the required add by actual tests without having recourse to Donder's Tables.

The accompanying Figures I and II will be found to be helpful not only to the practitioner in understanding the range of clear, comfortable near point vision provided by bifocals and trifocals, but they will also be helpful in explaining to many patients the limitations they must expect with bifocals and the extent to which an intermediate trifocal add will extend their near point range.

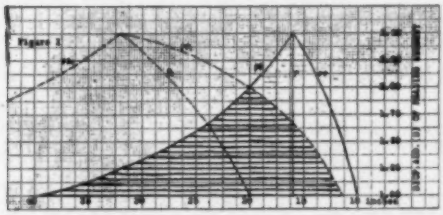

Fig. I. Trifocal ranges for a 16″ working distance. In the above figure the reading addition = D. The intermediate addition. I = D/2. Amplitude of accommodation = A. At 16″, D = 2.50—A/2.

$$P = \text{Near working distance.} = \frac{40}{D + \frac{A}{2}} = \frac{40}{2.5} = 16''$$

$$PP = \text{Nearest working distance.} = \frac{40}{D + A} = \frac{40}{5—D}$$

$$PR = \text{Farthest working distance.} = \frac{40}{D}$$

$$P_I = \text{Intermediate working distance.} = \frac{40}{I + \frac{A}{2}} = \frac{80}{5—D}$$

$$PP_I = \text{Nearest intermediate working distance.} = \frac{40}{I + A} = \frac{80}{10—3D}$$

$$PR_I = \text{Farthest intermediate working distance.} = \frac{40}{I} = \frac{80}{D}$$

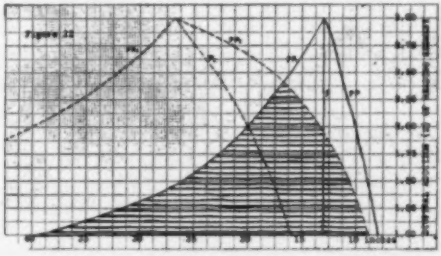

Fig. II. Trifocal ranges for a 13″ working distance. In the above figure the reading addition = D. The intermediate addition. I = D/2. Amplitude of accommodation = A. At 13″, D = 3—A/2.

$$P = \text{Near working distance.} = \frac{40}{D + \frac{A}{2}} = \frac{40}{3} = 13''.$$

$$PP = \text{Nearest working distance.} = \frac{40}{D + A} = \frac{40}{6 - D}$$

$$PR = \text{Farthest working distance.} = \frac{40}{D}$$

$$P_I = \text{Intermediate working distance.} = \frac{40}{I + \frac{A}{2}} = \frac{80}{6 - D}$$

$$PP_I = \text{Nearest intermediate working distance.} = \frac{40}{I + A} = \frac{80}{12 - 3D}$$

$$PR_I = \text{Farthest intermediate working distance.} = \frac{40}{I} = \frac{80}{D} =$$

IV. PRACTICAL CONSIDERATIONS

Most practitioners are more interested in the practical application and results of trifocal corrections than in theoretical considerations. Hence, in order to present an authoritative summary of this most important aspect, questionnaires were sent to a group of 200 ophthalmic practitioners who were believed to have had extensive experience in the prescribing of trifocal corrections.

It is interesting to note that of the 200 questionnaires sent, 153 were returned sufficiently completed to be used in this survey. This return of 75 per cent of the questionnaires completed is much greater than that usually experienced from surveys, in general, and is suggestive of the keen interest on the part of those responding. Several others replied that their experience did not permit them to complete the questionnaires adequately, but their letters expressed considerable interest in the study.

In preparing the questionnaires it was decided that the following factors represented a comprehensive coverage of all the considerations that might be influential in contemplating a prescription for trifocals:

1. Age of patient.
2. (a) Power of reading add.
   (b) Patient's intermediate working distance.
   (c) Patient's complaints.
   (d) Amplitude of accommodation.
3. If the reading add is important in determining the need for trifocals, what powers of reading add are most significant.

4. Ease of prescribing and fitting trifocals.
5. Difficulties in prescribing and fitting trifocals.
6. What means may be used to overcome the difficulties.
7. The number of trifocal prescriptions given. (This should serve as an index of the practitioner's experience.)
8. Percentage of trifocal prescriptions which are:
   (a) completely successful. (b) partially successful. (c) unsuccessful.
9. Does the benefit of improved vision at arm's length carry over in improved performance of the patient's visual tasks at his occupation.
10. Does the additional comfort provided by trifocals justify their cost.
11. The important points in which a prospective trifocal patient must be indoctrinated.
12. How do patients adjust to the wearing of trifocals as compared to bifocals:
    (a) more easily. (b) just as easily. (c) less easily.
13. Indications from careful case histories of the need for trifocal corrections.
14. Is there any great hesitancy among professional practitioners in prescribing trifocals, and if so, what are the reasons.
15. Is there an antipathy among patients relative to the use of trifocals.
16. Are there any suggestions which have not been mentioned that might aid in serving patients better with respect to the prescribing and fitting of trifocal lenses.

After careful study of the available literature and from consultations with several practitioners who had had considerable experience in prescribing trifocals and, also, after consideration of questions asked by students and beginning practitioners, it was felt that information on the above points would be helpful, especially if this information could be supplied by men most experienced in the actual prescribing and fitting of trifocal corrections. Of course, once the detailed information was secured by means of questionnaires and in some cases, augmented by personal interviews and/or further correspondence, there remained the task of compiling it and presenting it in an intelligible and readable manner.

The purpose of this report is to try to convey to those practitioners who are interested in better serving their patients likely to be benefited by trifocal corrections, the experience of men who have been prescribing trifocals for many years.

1. *Age:* Age, in general, was considered a factor. However, the need for trifocals as related to age is actually only as age is related to presbyopia.

2. *Intermediate add determined by:* The doctors replying to the questionnaires indicated that the most significant factor in deciding upon a trifocal correction was the *need of the patient*, i.e., his required intermediate working distance. Most important was the fact that a preponderant number of presbyopes are working at intermediate distances unmindful of the limitations of their bifocals.

The patient's complaints, i.e., symptoms: discomfort, inefficiency, etc., were listed as the second most significant factor in deciding upon a trifocal prescription.

The amplitude of accommodation and the required power of the

reading add were given third and fourth place considerations, respectively. Oddly enough, this is contrary to frequent academic teachings.

This information is very important and indicates that despite the theoretical indication of trifocal benefit to anyone requiring a certain add for reading, nevertheless, the patient's intermediate *needs*, or requirements for his job, are to be given primary consideration.

3. *Power of reading add:* Although most practitioners responding to the questionnaires indicated that the consideration of the power of the reading add was not as significant as the *needs* of the patient, nevertheless, there was almost universal agreement that those requiring an add of 1.75 D. or more would be benefited by trifocal corrections. Several practitioners reported that their experience had indicated considerable success in prescribing trifocals when the reading add was 1.25 D., because the transition from distance, to intermediate, to near vision was more gradual, "more continuous," with trifocals than with bifocals. More will be said about this aspect later in this report.

4. *Ease of prescribing:* In general, the replies to the questionnaires indicated that it was an easy matter to prescribe and fit trifocal corrections successfully. The main points mentioned were the necessity of a need for intermediate clear vision and the explanation and demonstration to the patient that trifocal lenses would permit clear vision for a wide range of near, intermediate and distant visual tasks. The use of a fitting set of trifocal lenses was mentioned frequently as a helpful aid. Another frequently mentioned point was the use of a frame or rimless mounting with adjustable nose pads so that the final prescription lenses could be raised or lowered slightly as the patient's demands necessitated.

In determining the proper height of the trifocal segment, it is advisable to consider the patient's posture—whether he holds his head erect or tipped forward; the type of work in which the patient is most frequently engaged; the height of former bifocal segments; and the adjustability of the frame or mounting to be used. The standard advice is to fit the top of the lower segment the same as is done for a bifocal case and permit the intermediate segment to lie above 5 to 7 mm., depending on the type prescribed. To the beginner, this advice is hard to accept for he fears that the intermediate segment will be too high and will annoy patients in walking about. A more conservative technique is to prescribe the reading segment 2 mm. lower than normal. This will usually insure that the top of the intermediate segment will be out of the way for walking and other tasks where it (the intermediate segment) is not needed.

Regardless of whether the trifocal lenses are prescribed by either of

the above techniques, it is a simple matter to alter the height of the segments by 2 or 3 mm. by an adjustment of the frame or mounting.

5. *Difficulties in prescribing:* Relative to some of the difficulties in prescribing and fitting trifocals, the practitioners who have had the most experience mentioned that if they erred at the beginning it was usually in prescribing the segments too low.

Difficulties were also experienced when the trifocal correction had been given in a frame which did not permit adjustments that would raise or lower the height of the segments.

Some practitioners reported that occasionally difficulties were experienced because a patient changed to an occupation requiring a different intermediate range than that for which the trifocal correction first had been prescribed.

6. *Overcoming difficulties:* The first difficulty mentioned above was overcome by prescribing higher segments or in adjusting the frame to raise the height of the segments.

Some doctors make a definite appointment for a "progress report" from their trifocal patients a few days after the new correction is given. In this way, any hesitation on the part of the patient to returning is avoided.

Many practitioners reported overcoming difficulty with trifocal patients through explanation of the function of the lenses integrated to their daily seeing tasks. The making of progress reports and patient indoctrination serves the practitioner as excellent clinical psychology. In general, the practitioners indicated that it was of the utmost importance to establish a favorable rapport between themselves and their patients, so that any difficulty experienced by the patients at first would be reported and cared for immediately. In this way any discomfort and inefficiency related to the use of the new trifocal correction could be discovered and remedied before the patient became discouraged.

7. *Number of prescriptions:* The number of trifocal corrections prescribed over a five year period varied from 50 to 2,000 among those replying to the questionnaire. The type of practice, location in industrial, urban or farming areas no doubt influenced the need for this type of correction and, also, the skill and experience of the practitioners were factors in determining their prescribing of three-way corrections.

The total number of trifocal prescriptions given by the 153 practitioners who responded to the questionnaire amounted to 22,640 pairs. Compared to any other special type of correction (telescopic spectacles, contact lenses, iseikonic corrections, etc.) these figures indicate a widespread demand for trifocal corrections, as well as provide an index for

the value of the experiences of those practitioners consulted which this report attempts to convey.

8. *Percentage of trifocal success:* In reply to the question concerning successfulness of trifocal corrections, the summary of the replies indicates that complete success was obtained in 92 per cent of the cases; in 7 per cent, partial success was realized, and only 1 per cent of the cases could be classed as failures.

This indicates further the "ease" of prescribing trifocal corrections since in 99 out of 100 cases, it is possible to obtain successful results.

It is realized that many questions could be raised on a scientific level regarding the practitioners' judgment of what constitutes a successful case; nevertheless, from a clinical standpoint there is no reason to question their judgment. Besides their professional interest in wanting to serve their patients, they wish their practices to prosper, and they would not be likely to ascribe credit to a new technique were they not convinced of its merits. In fact, the practitioner's successful experience with his patients is the most critical evaluation and the final proving ground.

9. *Improved vision related to work:* In an effort to determine the effect of improved vision at intermediate distances upon the patient's visual tasks, the practitioners were asked if their trifocal patients reported improvement in their work.

The answers received indicated that in over 90 per cent of the cases, the patients reported increased comfort and efficiency in their work. Examples of various occupations in which improvement was reported are: mechanics, jewelers, office workers, housewives, piano teachers, carpenters, telephone operators, store clerks, ministers, lecturers, mail clerks, bookkeepers, bank tellers, butchers, physicians, lawyers, draftsmen, typists, druggists, librarians, architects, weavers, electricians, dentists, printing press operators, cashiers, etc. Reports also mentioned the enjoyment of better intermediate vision for such visual hobbies as card-playing, billiards, golf, ping-pong, radio and television dialing.

10. *Comfort versus cost:* Realizing that the cost of trifocal corrections is greater than that of bifocals or single vision lenses, it was thought significant to inquire about the patients' reaction to the expense of trifocals as compared to the value in comfort and in efficiency.

Over 90 per cent of the practitioners reported that their patients felt the increased comfort provided by trifocal corrections justified their cost.

Although trifocal lenses are more costly than single vision lenses or bifocals, nevertheless, it seems that this expense is not a deterring factor when measured in terms of patient satisfaction.

11. *Patient indoctrination:* The experience of practitioners who have prescribed trifocal corrections should be helpful in aiding the beginner to advise his patients on points useful in indoctrinating new trifocal wearers. Many helpful suggestions were received. The demonstration by use of the trifocal fitting set that no blind intermediate areas existed was mentioned most frequently. The information gained from a careful case history, especially as to the occupation and needs of the patient, was another important point. Several practitioners advised that it was helpful to show presbyopic patients how their vision could be restored to that of "youthful vision" by the use of trifocal corrections and how they could have the advantages of three pairs of glasses in one pair of lenses. It was deemed wise to instruct trifocal patients to hold their heads in a natural, erect position and to move their eyes for best vision through the intermediate and the near segments.

Further points in indoctrinating new trifocal wearers will be presented in the discussions to follow.

12. *Trifocals versus bifocals on ease of adjustment:* Since most practitioners have had experience relative to the necessary adjustments of their patients when bifocals are first prescribed, it was thought helpful to compare the experience of those who have prescribed trifocals on their impressions of the relative ease of adjustment to trifocals versus bifocals.

Fifty per cent of the practitioners replying to the questionnaire stated that their experience indicated that patients adjusted to trifocals just as easily as to bifocals. Thirty-six per cent of the responding practitioners asserted that their patients became adjusted to trifocals *easier* than they had to bifocals, and 14 per cent of the practitioners felt that trifocals were more difficult to adjust to as compared to bifocals.

Anyone who has prescribed bifocals knows that for any patient who needs such correction there is little, if any, trouble in adjusting to this type of correction. It is significant to note the experience of those who have prescribed trifocals is that patients adjust to this type of correction just as easily as to bifocals and in many instances more easily.

13. *Value of case history:* As a still further check for information that might indicate the need of an intermediate correction, the questionnaire inquired as to the value of a careful case history in being indicative of trifocal need. This question ties in with Question 2 and the response indicated again that the *needs* of the patient are of primary importance. In a careful case history, the occupation, the hobbies, the requirement of clear intermediate vision for specific tasks, the symptoms of asthenopia, inefficiency, and slow change of focus are brought out.

14. *Hesitancy among practitioners:* The inquiry relative to

known hesitancy of professional colleagues in prescribing trifocals was intended to bring out the explanation of why the practitioners consulted felt their friends and associates did not share their views. In general, the explanation given consisted of: lack of initiative and experience; fear of cost; lack of inclination to take careful case histories and to spend time in explaining, demonstrating, and adjustment; lack of appreciation of job requirements; lack of confidence; misconception of patients' needs; the fact that younger practitioners do not appreciate the limitations of presbyopic patients; and the inability of some older men to overcome their inertia of "letting well enough alone."

Several practitioners replied that their professional colleagues had no hesitancy in prescribing trifocals and indicated thereby that they were in agreement.

It is always interesting to check on one's views for doing something by asking his explanation as to why his colleagues do not do likewise. If he ascribes the reason for his associates' not agreeing with him to factors other than those he advances for his own actions, one may be suspicious of the reasonableness of his contentions. However, there was remarkably good agreement in the replies received on the reasons why those who prescribe trifocals do so, as compared to the explanations of why others did not.

15. *Antipathy among patients:* In reply to the question of whether patients have an antipathy toward trifocals, half of the replyees reported that their patients had no antipathy toward trifocals and accepted them very readily. The other half of the replies indicated that patients did have some feeling against accepting the idea of trifocal corrections and that some helpful explanations and demonstrations were necessary. In many instances, patients had never heard of trifocals and, as is often true of older people, they were reluctant at first to consider something which they thought was "new"—and, in their minds, rather experimental. The explanation that trifocals had been used successfully for many years and that a great many people were now wearing them helped greatly to give confidence to many skeptical patients. Several of the practitioners who wear trifocals themselves stated that this fact helped to convince patients that "what is good for the doctor certainly ought to be good for me."

The fact that so many patients were unaware of trifocals and/or did not understand their usefulness suggests the need for some media whereby the public might be better informed. The old saying: "What a man does not understand, he opposes" has been shown in many other instances (vaccinations, inoculations, blood tests, chest x-rays, etc.),

to work against public health welfare.

It may be true that in some instances there has been unwarranted commercial propaganda about some aids to better health: nevertheless, the great bulk of information provided by several conscientious agencies (Metropolitan Life Insurance Company, Today's Health [formerly Hygeia], Better Vision Institute, etc.), for lay consumption has accomplished untold benefits for the general public.

16. *Suggestions for better service:* In response to the inquiry as to how patients may be served better with respect to the prescribing and fitting of trifocal lenses the practitioners offered several suggestions. One point that was mentioned most frequently as a helpful aid was the use of the trifocal fitting set, which is simply a series of trifocal lenses set into 1½ inch rings and which may be inserted in the trial frame in addition to the distance correction. A convenient and practical selection of powers for a trifocal fitting set consists of only five pairs of lenses with the total (reading) adds ranging from 1.50 to 2.50 D. in quarter diopter steps. The intermediate segment powers are usually 50 per cent of the reading add in each lens. It is an easy and convincing demonstration to show presbyopic patients how they may see clearly at the usual reading distance, at a useful intermediate distance, and at far distances.

Several practitioners prefer to speak of trifocals as "three-way vision lenses" since they feel that some patients are affected adversely by any kind of "—focals." Other practitioners stated that they stress the point of "youthful vision" with trifocal lenses.

Another good idea is that of referring to trifocals as *"continuous vision lenses"* since this expression aptly describes the salient benefits which are experienced by those who have trifocals.

There were repeated comments on the need for a dignified public relations program which would educate the public and the ophthalmic practitioners in the merits and availability of trifocal corrections. It is interesting to note a recent article[12] on "Trifocals" in *Today's Health.*

The use of "three-way vision" or "continuous vision" lenses in industry was also mentioned as being not only an advantage to industry but also a service to the presbyopic employees whose personal comfort, efficiency, safety and production would be enhanced significantly. The increased use of trifocal corrections in industry would have an ever-widening circle of influence in acquainting others with the benefits of this type of correction.

In answer to Question 16, several practitioners repeated the need for careful case histories. This was discussed above in several places, and it is significant to note how often and in how many different con-

nections the value of a careful case history is emphasized. We are reminded constantly that we are dealing with a patient-*as-a-person*—rather than a set of findings. The symptoms, visual and somatic complaints, the needs of the patient, job and hobby visual requirements, are clearly of paramount importance.

The above is not to be construed to mean that patients are so accommodating as to say in just so many words: "I think I need trifocal lenses because I cannot see clearly at arm's length!" The beginning practitioner often fails to see the needs of the patient and excuses himself on the grounds that the patient was not very explicit. A patient may report that he has headaches and eye fatigue, he may also disclose that he is a turret lathe-operator, a barber, or a pants-presser. He expects the doctor to determine if his eyes used in connection with his work require aid in the form of single, double or multi-vision lenses.

The technique of obtaining all the pertinent details in a thorough case history is perhaps the most outstanding earmark of a competent practitioner. In fact, to be a competent practitioner, it is necessary to be somewhat of a detective. Besides the essential basic knowledge of the intricacies of the eye, its appendages and their related functions, the best recipe for a careful case history is: common sense, experience and putting yourself in the patient's place.

Referring once more to the patient's expression, either directly or indirectly, to the "need" of better vision at intermediate distances, there are some practitioners who feel that what the patient does not know about, he does not miss. That is, if a presbyopic patient seems to indicate that he is unaware of the possibility of improved intermediate range vision, he might just as well be left in ignorance. Fortunately, this view is not held by many practitioners.

It should be a routine part of the examination of every presbyopic patient to demonstrate that vision may be made clear not only at 20 feet and 16 inches but also at intermediate distances. One practitioner wrote that for many years he had shown his patients the vision that lenses would afford at 20 feet and at 16 inches. He had never considered that his patient had a "need" for clear vision at any other range until he began to include in his examination a demonstration of how clear vision could be made at 3 feet. The inclusion of this simple step was brought about by the practitioner's discovery in his own case that having reached age 50 he was having difficulty in performing many tasks which were beyond the range of his bifocal lenses. Once he had obtained trifocals for himself and included the 2-minute intermediate range test in his routine examination, he found many patients who

did not have a "need" for clear vision at arm's length. The practitioner confessed that he often wonders now how many patients he misserved relative to their intermediate vision range during the many years in which he sought to fulfill the visual "needs" at only 20 feet and 16 inches.

One may wonder if there was a recognized "need" for bifocal lenses before Benjamin Franklin cleverly designed his own double-vision lenses. It is indeed clear that once bifocal lenses became available a "need" for them developed and a great many people have been benefited thereby.

The following condensation of reports from several practitioners will present further suggestions which have proven useful in the prescribing of trifocal corrections. The willingness on the part of the practitioners who have provided these additional notes to share their experience is appreciated.

V. EXPERIENCES OF INDIVIDUAL PRACTITIONERS

Under the section of the questionnaire requesting additional comments and from interviews with several practitioners, there were many individual aspects which merit presentation.

Dr. F. S. reported that his experience indicated trifocal corrections were easier for patients to adjust to than bifocals. He pointed out that the range and flexibility of vision of a trifocal correction are not possible with any other type of lens and he believed the reason for easy adjustment to trifocal lenses may be attributed to the fact that the change in power is more gradual than it is in bifocal lenses as the patient moves his gaze downward. Dr. F. S. felt that trifocals would be used more frequently if the general public were more aware of their existence. He believes that many practitioners hesitate to mention the use of three-way vision lenses as long as the patients do not seem to be aware of their availability.

This practitioner felt that a professional public relations job is necessary. He pointed out that capable writers using material supplied by qualified eye men should write articles about trifocal lenses for public consumption and that the flow of such literature should be continuous until the word "trifocal" is as commonly known as the word "bifocal." He believes that only when the public is sufficiently educated to the advantages of trifocal corrections will the practitioners consider trifocal lenses as a standard, or routine, aid for presbyopic patients.

It seems that the public will have to lead the way toward the increased use of this type of correction. This may be a sad reflection upon

the ophthalmic practitioners. From a scientific point of view, it would seem that eye doctors should know what is best. However, from a practical point of view, history has shown that many advances in the health and efficiency of people's vision have only been brought about by public demand. The human factors and the time involved on the part of the practitioners in explaining a new device or method of treatment often discourage the busy practitioner from making the necessary effort. The acceptance of many aids to vision has more often been attained by public knowledge rather than the insistence of conscientious practitioners.

Dr. F. S. reported that although he did not know a trifocal fitting set was available, he had demonstrated to his presbyopic patients the limitations of bifocals or of two pairs of glasses by showing them a test card which illustrated playing cards and sheet music. He pointed out the range of near vision and the extent of distance vision with appropriate lenses and showed that for intermediate use as in playing cards or reading music a third correction would be necessary. Such a correction could only be obtained with trifocals. He also mentioned that every patient for whom he had prescribed trifocals insisted upon this type of correction on subsequent examinations.

He had prescribed the intermediate segments in widths from 3 to 6 mm. He preferred the narrower width because he found older people often had small pupils and the small intermediate segments gave adequate field of vision. An advantage in using a 6 mm., or less, intermediate segment is that it does not interfere with the distance field. Dr. F. S. usually prescribes the height of the lower segment 1 mm. lower than he would ordinarily fit a bifocal, and he prefers to prescribe trifocals only after a bifocal correction has been tried.

Dr. A. reported that his own trifocal lenses which he had prescribed for himself had been most satisfactory, but that his experience in prescribing trifocals for his patients had been very unsatisfactory.

He stated, "I mention this because if I am able to prescribe for myself, I should be able to do as satisfactory a job for a patient, so there must be something wrong somewhere."

Dr. A. mentioned further that "your questionnaire is very complete and I hope you will get sufficient returns to permit the issuance of a report that will enable practitioners, such as I, to satisfactorily prescribe."

Dr. K. reported that he had been wearing trifocals for three years with complete satisfaction. He stated that the chief indications for prescribing trifocal corrections were (1) in a case that requires an add of 2.00 D. or higher, and (2) where there is a need for an intermediate range of clear vision. Practically every trifocal correction prescribed by

Dr. K. gave complete satisfaction—especially after a few adjustments had been made. These adjustments consisted of small corrections in the tilt or height of the lenses and were readily accomplished when an adjustable type frame or rimless mounting was used. When patients who had been given trifocal corrections returned for re-examination they invariably insisted upon trifocals again. Many patients were so enthusiastic about their trifocals that they took pleasure and pride in showing them to their friends with the comment that while most people have one- or two-way vision in the glasses, theirs had three-way vision for clear vision at all distances.

Dr. K. prefers to fit the segments low in the first pair of trifocals—that is, the top of the intermediate is set 3 mm. above the geometric center of the lens. Of course, this varies somewhat with the patient's posture and intermediate visual needs. He has experienced best results in prescribing a 6 mm. rather than an 8 mm. segment and he reports that the field of vision provided by a 6 mm. segment is quite adequate for most patients.

It will be noted that Dr. K., by fitting the top of a 6 mm. segment above the geometric center to the extent of 3 mm., will have the top of the lower segment only 3 mm. below center. Since most practitioners fit bifocal segments 2 mm. below center, Dr. K. is reducing the height of reading add by only 1 mm.

Dr. S. S. believes that a much better public relations job is needed to acquaint both the public and the practitioners with trifocals. He states that when he recommends a trifocal correction to some patients, it is such a novel idea that they wonder about "experimenting with them." He does not feel that the slightly greater cost of trifocals is a serious deterrent and mentions that the public has been willing to pay more for "fancy frames" because of the attention given them by means of television, movies, radio, newspaper and popular magazine articles. Of course, there is a question as to whether fancy frames can be compared to trifocal corrections. In the former case, there is the cosmetic appeal which has considerable weight. However, Dr. S. S. maintains that people are willing to pay more for better vision if "they can be shown that it will serve their needs more satisfactorily."

Dr. S. S. states: "I have no hard and fast rule as to where I set the near and intermediate segments. It depends on the fit of the frame, how the person uses his eyes, and on the way he carries himself. I usually use a trifocal having a 6 mm. intermediate height.

Dr. F., in commenting upon trifocal correction, stated: "The biggest problem facing the eye specialist who prescribes multi-focal

lenses is patient acceptance. In prescribing these lenses the doctor must be as much psychologist as refractionist."

One of the factors to be overcome is the much too general feeling that bifocals or trifocals are "the badge of old age." If it can be pointed out that the badge of old age is shown more readily by the contortions of people trying to see at various distances with their single or double vision lenses, multi-focal lenses can be prescribed with the assurance that they will provide an intelligent and flexible attitude commensurate with maturity.

Dr. F. has found it helpful to give his patients a typewritten instructions sheet on "How to Become Accustomed to Your New Glasses" which points out the advantages and the limitations of the new lenses.

Dr. G. reported that: "I believe almost all eye practitioners accept the trifocal as the ideal solution for the purpose for which it is designed, namely, to provide uninterrupted clear vision throughout the entire field of vision in those cases of lowered accommodative ability. That being the case, I believe it is advisable for all those eye men who are in the presbyope class of 1.75 add or higher, to wear trifocals themselves, as many already do. The patient will want what the doctor has. 'If it is good enough for the doctor, it is good enough for him.'

"It would seem that men who are in practice a relatively few years rarely fit trifocals. I believe an important reason for this is the failure of the schools to cover the subject properly. There is also a deficiency of postgraduate instruction available. Subjects like this could well find a place in postgraduate courses. Perhaps the various manufacturers might offer coverage of such subjects by qualified personnel on their technical staffs."

Dr. R., who has been in practice over 40 years, reported: "Before the advent of trifocals as a marketable product, I carried a zyl trial frame with plus 1.50 D. spheres. These I held before my bifocals and peered through my distance correction to get clear vision at arm's length.

"When a 'missionary' (from one of the optical companies) first demonstrated the trifocal to my great satisfaction, I expressed the hope to acquire a pair at the earliest possible moment. I was so enthusiastic that he promised me the first pair delivered in my city.

"My young colleagues, most of whom had not reached presbyopic age, were timid about prescribing trifocals—but that attitude soon changed and I no longer enjoyed the seeming monopoly in prescribing trifocals.

"My favorite argument with persons needing trifocals is as follows: 'You see perfectly in the distance, through the upper part of your lenses:

likewise at near through the lower part. But there is a distance in between, at arm's length, at which you are practically blind for small objects. For example, as in looking at the merchandise in a jeweler's window. By the simple addition of an intermediate strength correction, you are as well off visually, as a young person.' That usually helps them to a decision."

Dr. R. also presented an interesting example which he used in discussing trifocals with his patients. He referred to bifocals as having to step from the floor onto a high stool and how much easier it would be if there were an intermediate small stool handy which is like the intermediate segment of trifocals.

Many more comments from individual practitioners were received. They were similar in context to those given above. In general, it is very encouraging to find that those men who have had long experience in prescribing trifocals are anxious to share their experience for the benefit of their colleagues and for the ultimate benefit of the public. The responses received illustrate the true professional attitude of wanting to be of help to the public through increased knowledge shared by those in the ophthalmic field.

The enthusiasm and willingness on the part of those participating in this survey to take the time and effort to convey their experiences is appreciated and assists greatly in making the writer feel that this study is worth while. Without their cooperation this report would not have been possible, and the writer is most indebted to them.

It is hoped that this survey of what have been the experiences of a representative number of practitioners will aid in advancing the general knowledge on the subject of trifocal corrections. There are other projects being conducted in several fields which will have an important bearing on specific problems involved in multifocal corrections and the results of these further studies may influence greatly the practices that have been reported in this paper. As a consequence of these investigations, and like that which has occurred with respect to other visual aids validated by clinical and scientific studies, trifocal corrections or *"continuous vision lenses"* will be considered more frequently in appropriate cases for the betterment of visual comfort, skill and efficiency.

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ERRATUM

In the paper, "Veridical Perception," by Dr. Eugene Freeman, in the April issue, the first paragraph on page 217 should read as follows:

There are large stakes at issue here. When our perception is designated as being veridical, what our designation means is that the joint testimony of all of the senses whose testimony is relevant in a particular perceptual situation assures us that the objects which we perceive, and the qualities which we perceive in them, are not merely fabrications invented by our perceptual machinery. Instead, they are brute facts, with a stubborn otherness, or non-subjectivity, or *Peirceian Secondness* irreducibly at their core. Accordingly, we can proceed in our actions "as if" the objects which we perceive had an objective existence, and "as if" the qualities which we perceive in the objects will continue to be perceived in the objects when the perceptual situation recurs. But suppose that each of our senses were to produce skillful counterfeits in the form of non-veridical perceptions which were consistent with each other, but which were all devoid of objectivity and possessed only subjective reality. Suppose, then, that this were the case. The external world and everything in it would be dissolved into nothingness, and we would be left with an imaginary world ingeniously constructed inside of our own skulls out of the only things that we can know at first hand, namely our sensations. We would then live alone, as the solitary inhabitants of our own private universes imprisoned in the philosophic system known as *solipsism* (from the Latin word *solus*, meaning "alone"). All of the other people imprisoned with us in the unfortunate plight of being solipsists would incidentally be locked up by society in insane asylums, unless they were granted reprieves because they were professors of psychology, in which case they would be considered harmless and would be permitted to remain in their own solipsistic prisons.

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MILITARY REQUIREMENTS AND VISION TRAINING

Now that another war seems imminent and Selective Service is calling more and more men, there is beginning to be an increase in the number of young men consulting optometrists relative to improving their visual acuity or their color vision so that they may pass the requirements for the Air Force, the Marine Corps and the Navy.

This raises the question of the moral and professional responsibility of optometrists who are called upon to give advice on this serious matter. From the standpoint of the young man who is seeking enlistment in one of these services, it might at first glance seem that he is being quite patriotic to want to join the military rather than wait to be drafted. From the standpoint of the optometrist, it might seem that he was

rendering an important personal and military service by making available to the services some young man who would otherwise be drafted. There is also the financial side which may motivate some optometrists. However, the three aspects mentioned above should not be given serious consideration.

Of major importance is the consideration of whether or not a young man who cannot readily pass, for instance, the Air Force requirements without any training, "rehabilitation," or coaching is going to endanger his own and the lives of others (his comrades) as well as be likely to ruin expensive equipment during his cadet training.

Despite the fanfare and sensational claims beginning with the Bates' method prior to World war I and that which reappeared during the last war, especially among some optometric groups, there has been no scientific evidence that myopia, or any form of ametropia, or color blindness could be altered significantly by any form of training. To the contrary, there have been two definitive studies in recent years which indicated that the degree of myopia was not materially affected by the vision training given. Likewise, there have been at least two careful studies which indicated that color blindness was not materially affected by training. To be sure, one's ability to read the Snellen chart or some of the various color vision plates may be improved by practice and various forms of associated training. However, this improvement *in performance* must not be mistaken—as it has been by many—to mean that the degree of ametropia or of color blindness has been changed. Nor does it mean that there is a transfer of learning which will enable one to perform equally well on different, but related tests. The improvement resulting from the various forms of vision training simply means that certain skills necessary to read letters or colored numerals have been improved.

This is not to say that vision training, in general, is without value. There is good evidence that appropriate training is helpful in relieving symptoms assocated with neuro-muscular anomalies. There is also good evidence that appropriate training will improve one's ability in reading, drawing, painting, and in certain sports. These improvements are in themselves a significant achievement both to the patient and to the optometrist.

An advocate of vision training for myopic airplane pilots should ask himself if he would like to ride with a myopic pilot, who may have learned to read 20/20, or if he would like to have his son in the same plane. There may be certain visual requirements for some branches

of the service with which we do not agree. But, for Air Force pilots it would seem highly desirable to have the most strict visual requirements.

The practice of giving vision training to military aspirants may bring discredit to our profession especially since there is no confirmatory evdence, but there is definite negative evidence, that the refractive status of the eye is not affected by vision training.

The moral and professional obligation of optometrists should at all times consider the public welfare rather than any individual's desire to circumvent military requirements. With this principle in mind, the optometrist will render a greater public service, both for the military and lay population, if he will honestly advise myopic young men that while training would likely improve their ability to read a line or two better on the Snellen chart, the degree of myopia cannot be changed and if the branch of the service which the young man is hoping to enter prohibits any myopia, then, the young man should not jeopardize his own or the lives of others by trying to squeeze by the vision requirements as set by the armed services.

ROBERT E. BANNON

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

SCHOOLS SEEK PLACE ON A.O.A. COUNCIL ON OPTOMETRIC EDUCATION

Dr. Ernest A. Hutchinson, President of the Association of Schools and Colleges of Optometry, has recently renewed the request of the Association to the A.O.A. for representation on the Council on Optometric Education. The Association asks that it be given two seats on the Council. In his April 26 report, Dr. Hutchinson points out that if this representation is granted, the Council on Education will be strengthened and its work made more effective, as the Council will be able to better understand the problems of the schools by having educators on the Committee.

THE SWING AWAY FROM FREE SERVICE

Optometrists in Great Britain are finding out that there is never a dull moment under a program of State health care. They are also learning that the transition from health service under free enterprise

to socialized medicine as now carried on will probably prove financially disastrous to 40 per cent of them.

The British optometrists are certainly getting their share of the organized confusion which inevitably accompanies a program of socialized medicine. A little more than two years ago their private practices were virtually eliminated by the granting of free refractions and spectacles to all who cared to apply for them. This naturally produced a flood of patients. Production of spectacles lagged far behind refractions. Patients waited from six to 18 months for their glasses and naturally were incensed at optometrists for the delay. Then the demand for refractive care fell off to a point lower than the normal demand under a free economy. At this stage, officials in charge of the program instituted a small partial charge for materials. Now under new budget provisions, British refractive patients are warned that shortly they will be called upon to pay one-half of the cost of the work. Under this State controlled program government officials estimate that the gross volume of practice of the average British optometrist will amount to not more than five to six thousand dollars a year. From this sum he must pay his taxes, the cost of materials and his office overhead.

American optometrists genuinely regret the difficulties British optometrists are having with this program of State health care. They note the more recent swing away from free service. It is possible that the British socialistic experiment may in time shake down into a useful program of health care for the needy and only emergency care covering high-budget-health items for the majority of the population.

CERTIFIED CLINICAL PSYCHOLOGISTS

The model psychologists' bill proposed recently in the Minnesota legislature was passed late in April carrying two significant amendments. This bill was approved by Governor Luther Youngdahl. The amendments prohibit psychologists from practicing (1) medicine and (2) optometry. Under the terms of this act, psychologists are licensed as certified clinical psychologists. According to University of Minnesota psychologists, these new health workers will be active in institutions dealing with mental care programs. A similar model psychologists' bill without the amendments was passed by the New York legislature and vetoed by Governor Dewey.

A.O.A. CONVENTION AT NEW ORLEANS

Probably you've thought of it yourself many times, but we'd

like to comment here that each A.O.A. Congress provides an opportunity for optometrists to absorb a little history of our country the pleasant way. Congress planners always see that there is plenty of time to explore the convention city, and make it a point to provide historical background through advance publicity so that members know a little about the city they are visiting. Take the coming Congress in New Orleans, for example. Dr. Warren Reynolds, Congress publicity chairman, has sent us literature showing New Orleans as one of America's most romantic and paradoxical cities. It is modern. It is old. The atmosphere is a combination of European and American rare in the United States. New Orleans was founded by the French in 1718, and the French atmosphere mingles with modern American. There are famous eating places, and historical sites to visit. All these facts make us sure New Orleans is one of the most interesting places the A.O.A. could have chosen for its Congress.

On the educational side of the Congress, Dr. Reynolds tells us that Dr. H. Ward Ewalt, Jr., of Pittsburgh has been chosen moderator for the Sunday (June 24) educational program. In keeping with the chosen theme, "The Social Impact on Visual Performance," five spokesmen for science fields basic to optometry will report recent research developments. It will be Dr. Ewalt's job to interpret these developments in terms of practical application in an optometric practice. Dr. Ewalt is a Fellow of the American Academy of Optometry, a member of the National Interprofessional Committee on Eye Care, optometric consultant to the Surgeon General of the United States Army, and chairman of the A.O.A. council on education and professional guidance. Panel speakers will be Dr. Kenneth B. Stoddard, Dean, School of Optometry, University of California; lecturers Dr. G. N. Getman and Dr. D. B. Harmon; Dr. Warren McCulloch, professor of psychiatry, College of Medicine, University of Illinois in Chicago, and Dr. Paul Boeder, director, Bureau of Visual Science, American Optical Company.

Monday's educational program will feature Dr. Peter Kronfeld, professor of ophthalmology, University of Illinois School of Medicine; Dr. E. H. Westland, chairman, A.O.A. Occupational vision committee; Dr. N. C. Kephart, Purdue University psychologist; Dr. Edmund F. Richardson, national chairman, Congress committee. Educational chairman of the Congress is Dr. O. J. Melvin, New Orleans. Those dates again—June 24-27, 1951, for the 54th Annual Congress of the American Optometric Association. Congress headquarters, The Roosevelt Hotel, New Orleans, Louisiana.

OPTOMETRIC RESERVISTS ORGANIZE

Last December, at a meeting in Chicago, Illinois, an Association of Military Optometrists of the United States was formed by a group of active reservists to "serve the national welfare by devotion to matters relating to military optometric duty." Specific goals now set up by the organization, and announced April 27 by Lt. Col. E. W. Strawn, president, are:

Assisting and advising and cooperating with those responsible for effectively implementing and maintaining efficient optometric care in the military service.

The promotion and encouragement of interest in the military optometric career.

Increasing the efficiency of its membership by mutual association and by the consideration of matters pertaining to the optometric-military service in the United States both in war and peace.

Supporting research in military visual problems.

Charter members of this group number 23, and officers elected at the first meeting were as follows: Lt. Col. E. W. Strawn, Freeport, Illinois, president; Capt. D. R. Reed, LaPorte, Indiana, secretary-treasurer; Lt. Col. Elwin Marg, Berkeley, California, Air Director; Capt. Harold M. Fisher, New York City, Army Director; Lt. John E. Martin, Carroll, Iowa, Navy Director.

The organization is anxious to contact other optometric reserve officers and anyone interested should write Capt. Dr. R. Reed, 204 Masonic Temple Building, LaPorte, Indiana.

EYE CARE IN JAPAN

From Japan come these interesting facts about eye care. We quote a letter received by James C. Bradley, a student at Los Angeles College of Optometry, from his sister who is now living in Japan: "Over here, Japanese plastic frames cost about $2.50 and I could get lenses like mine ground for $2.50, making a pair of glasses cost $5.00 without the examination. You should see the Japanese determine the lenses you need. You have seen people buy glasses in the dime store in the States? Well, that is the way it is done over here, and where I get my frames, one of the staff that does that work is a boy about 15 years old. They have no instruments, no dark room—just a chart on the wall, a chair, and the different cut lenses to try on. Oh yes, they have a lens trimmer and a hot plate to heat the plastic frames, and a pan of water to dip the glasses in. Very few women wear glasses, probably because being so inferior to the men, they don't have to see as well. The frames the Japanese wear are either metal or heavy tortoise shell."

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

LOCAL CHAPTER ACTIVITIES

MARYLAND CHAPTER

Dr. Harold Simmerman, Academy president, was guest speaker at the April meeting of the Maryland Chapter. His topic was, "The Principles of Psychology in Relation to the Visual Problem."

MICHIGAN CHAPTER

New officers installed at the annual meeting of the Michigan chapter were Dr. T. R. Bell, Alpena, chairman; Dr. Paul Connolly, Detroit, vice-chairman; Dr. Wayne H. Chapman, Charlotte, secretary-treasurer.

ARKANSAS CHAPTER

Officers elected at the annual meeting of the Arkansas Chapter are Dr. O. H. Johnson, Jonesboro, president; Dr. C. H. Brown, Little Rock, vice president; Dr. W. H. Dowdell, Malvern, secretary; Dr. C. G. Melton, Fayetteville, executive councilman.

SAN FRANCISCO BAY AREA CHAPTER

The first meeting of the San Francisco Bay Area chapter was held the last Thursday in March, with Dr. Meredith W. Morgan, Jr., acting as temporary chairman. In the elections held at this meeting the following officers were elected: Dr. Meredith W. Morgan, Jr., Berkeley, chairman; Dr. Gordon Walls, Berkeley, vice chairman and program chairman; Dr. R. Marshall, San Bruno, secretary-treasurer. Plans were made to hold meetings not less than every two months. A membership committee was also elected: Dr. Arthur Emmes, Castro Valley, chairman; Dr. Henry Peters, Oakland; Dr. Arthur Jampolsky, San Francisco; Dr. Frederick Hebbard, Berkeley; and Dr. Charles Hobrecht, San Francisco. Two classes of membership were approved: regular and associate.

The April meeting of the chapter featured A. E. Maumenee, M.D., Division of Ophthalmology, Stanford University Hospitals, who lectured on "Corneal Transplantation."

SOUTHERN CALIFORNIA CHAPTER

Current research projects under way at Los Angeles College of Optometry were reviewed for members of the Southern California Chapter at their April meeting by Dr. Monroe J. Hirsch. The dinner meeting was held in the library of L. A. College.

BOOK NOTICES

MANUAL OF OCULAR PATHOLOGY FOR OPTOMETRISTS. George A. MacElree, Jr. (Pennsylvania State College of Optometry.) Pennsylvania State College of Optometry Press, Philadelphia, Pa. 6th Edition. 538 pp. 81 illustrations. $8.

This book was written to satisfy a need for a text on ocular pathology for optometric students. In his Foreword, the author points out that he has no intention of invading the field of medicine but rather,

he hopes that the ophthalmologist and the optometrist will understand each other better by a mutual knowledge of the vocabulary and the fields common to both professions, so that the ultimate goal of the prevention of blindness may be realized more effectively.

The emphasis in this manual is placed chiefly upon *diagnosis* so that the optometrist may be better able to judge when the referral of patients to other specialists is necessary. The sections on *therapy* are very brief and are included so that the optometric student may become somewhat acquainted with this field and may thereby be better able to cooperate with the ophthalmologist.

The arrangement of the material is especially well-designed and is amply illustrated by many well-executed drawings, most of which are original. The sequence of chapters follows the anatomical arrangement of the eye and its adnexa, e.g. Diseases of the Eyelids, Conjunctiva, Lachrymal System, Orbit, Cornea, Sclera, etc.

These anomalies are each discussed with respect to the various inflammations, degenerations, injuries, neoplasms, aberrations in development and circulatory disturbances peculiar to that portion of the eye being considered. This combination of two systems of classification makes it possible to review the various disturbances from both the anatomical and the pathological aspects.

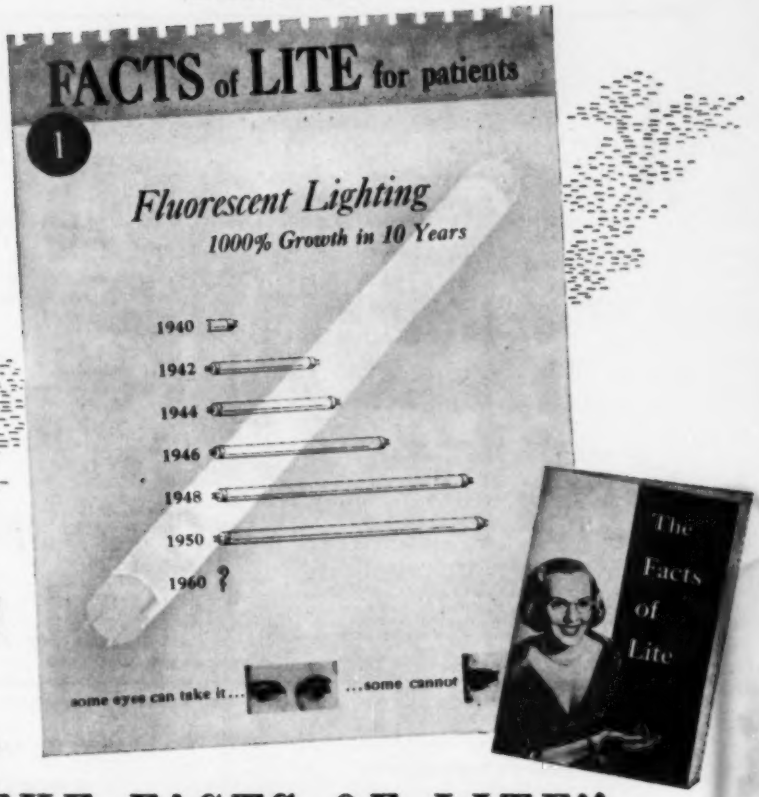
The manual is further systematized by dividing the study of a single disturbance into the following points: Name of Condition, Symptoms, Clinical Picture, Etiology, Histo-Pathology, Course, Sequelae, Prognosis, Treatment.

There is also included a chapter on the Ocular Manifestations of Systemic Disease.

The Appendices present a condensed review of (1) Methods of Disease Classification, (2) Aberrations in Development, (3) Degenerations, (4) Inflammations, (5) Injuries and Disturbances in Nutrition and Circulation, (6) Bacteriology.

This book should aid greatly in enhancing the cooperative efforts of optometrists, ophthalmologists and general physicians in their mutual efforts toward providing better eye care for the public and in the early recognition of conditions which so frequently cause blindness.

ROBERT E. BANNON.



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(To be continued in the June issue.)

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by

Solve Stenstrom, M.D.

Translated from the original German by

Daniel Woolf, O.D.

School of Optometry, Columbia University, New York, New York

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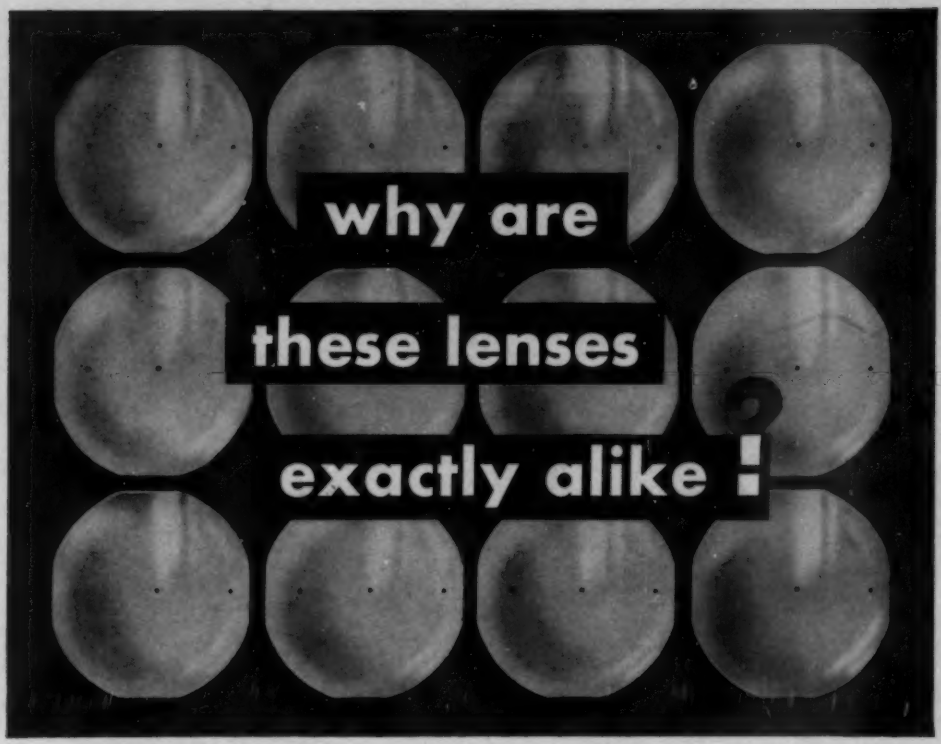

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